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VOLUME II

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APPENDICES TO POND WATER MANAGEMENT INTERIM MEASURES/INTERIM REMEDIAL ACTION DECISION DOCUMENT

U.S. DEPARTMENT OF ENERGY

EG&G ROCKY FLATS, INC.

NOVEMBER 22, 1993

LIST OF APPENDICES

APPENDIX

APPENDIX A
BIG DRY CREEK
SEGMENT 4 AND 5 STREAM STANDARDS

APPENDIX A

TABLE OF CONTENTS

APPENDIX A

TABLE OF CONTENTS

STREAM CLASSIFICATIONS and WATER QUALITY STANDARDS

REGION: 3 BASIN: Big Dry Creek Stream Segment Description	Desig	Classifications	NUMERIC STANDARDS PHYSICAL and BIOLOGICAL	INORGANIC mg/l		METALS ug/l			TEMPORARY MODIFICATIONS AND QUALIFIERS
1. Mainstem of Big Dry Creek, including all tributaries, lakes and reservoirs, from the source to the confluence with the South Platte River, except for specific listing in Segment 2, 3, 4 and 6.	UP	Aq Life Warm 2 Recreation 2 Agriculture	D.O.=5.0 mg/l pH=6.5-9.0 F.Coli=2000/100ml						
2. Standley Lake.		Aq Life Warm 1 Recreation 1 Water Supply Agriculture	D.O.=5.0 mg/l pH=6.5-9.0 F.Coli=200/100ml	NH_3(ac)=TVS NH_3(ch)=0.06 Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.5 NO_3=10 Cl=250 SO_4=250	As(ac)=50(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=300(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=50(dis) Mn(ch)=1000(Trec) Hg(ch)=0.01(Tot)	Ni(ac/ch)=TVS Se(ac)=10(Trec) Ag(ac/ch)=TVS Zn(ac/ch)=TVS	See attached Tables 1A and 2 for additional standards for segment 2. Also, Beryllium=4 ug/l.
3. Great Western Reservoir.		Aq Life Warm 1 Recreation 1 Water Supply	D.O.=5.0 mg/l pH=6.5-9.0 F.Coli=200/100ml	NH_3(ac)=TVS NH_3(ch)=0.06 Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.5 NO_3=10 Cl=250 SO_4=250	As(ac)=50(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=300(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=50(dis) Mn(ch)=1000(Trec) Hg(ch)=0.01(Tot)	Ni(ac/ch)=TVS Se(ac)=10(Trec) Ag(ac/ch)=TVS Zn(ac/ch)=TVS	See attached Tables 1A and 2 for additional standards for segment 3. Also, Beryllium=4 ug/l.
4. Mainstem and all tributaries to Woman and Walnut Creeks from sources to Standley Lake and Great Western Reservoir except for specific listings in Segment 5.	UP	Aq Life Warm 2 Recreation 2 Water Supply Agriculture	D.O.=5.0 mg/l pH=6.5-9.0 F.Coli=2000/100ml	NH_3(ac)=TVS NH_3(ch)=0.10 Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.5 NO_3=10 Cl=250 SO_4=250	As(ac)=50(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=300(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=50(dis) Mn(ch)=1000(Trec) Hg(ac)=0.01(Tot)	Ni(ac/ch)=TVS Se(ac)=10(Trec) Ag(ac/ch)=TVS Zn(ac/ch)=TVS	See attached Tables 1A and 2 for additional standards for segment 4. Also, Beryllium=4 ug/l. ug/l.
5. Mainstems of North and South Walnut Creek, including all tributaries, lakes and reservoirs, from their sources to the outlets of ponds A-4 and B-5, on Walnut Creek, and Pond C-2 on Woman Creek. All three ponds are located on Rocky Flats property.	UP	Aq Life Warm 2 Recreation 2 Water Supply Agriculture	D.O.=5.0 mg/l pH=6.5-9.0 F.Coli=2000/100ml	NH_3(ac)=TVS NH_3(ch)=0.10 Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.5 NO_3=10 Cl=250 SO_4=250	As(ac)=50(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=300(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=50(dis) Mn(ch)=1000(Trec) Hg(ch)=0.01(Tot)	Ni(ac/ch)=TVS Se(ac)=10(Trec) Ag(ac/ch)=TVS Zn(ac/ch)=TVS	Radionuclide standards have the temp mod of ambient quality until 12/31/94. See attached Table 3 for temporary modifications until 4/1/96. See attached Tables 1A and 2 for additional standards for seg 5. Also Beryllium=4 ug/l. Goal qualifier for all use classifications.
6. Upper Big Dry Creek and South Upper Big Dry Creek, from their source to Standley Lake.	UP	Aq Life Warm 2 Recreation 2 Water Supply Agriculture	D.O.=5.0 mg/l pH=6.5-9.0 F.Coli=2000/100ml	NH_3(ac)=TVS NH_3(ch)=0.10 Cl_2(ac)=0.019 Cl_2(ch)=0.011 CN=0.005	S=0.002 B=0.75 NO_2=0.5 NO_3=10 Cl=250 SO_4=250	As(ac)=50(Trec) Cd(ac/ch)=TVS CrIII(ac)=50(Trec) CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=300(dis) Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ch)=50(dis) Mn(ch)=1000(Trec) Hg(ch)=0.01(Tot)	Ni(ac/ch)=TVS Se(ac)=10(Trec) Ag(ac/ch)=TVS Zn(ac/ch)=TVS	

Taken from: Colorado Department of Health-Water Quality Control Commission, Classification and Numeric Standards South Platte River Basin, Laramie River Basin, Republican River Basin, Smoky Hill River Basin 3.8.0.19

TABLE 1A
SITE-SPECIFIC ORGANIC CHEMICAL STANDARDS
SEGMENTS 2, 3, 4, AND 5, BIG DRY CREEK[1]
(ug/l)

PARAMETER[2]	STANDARD[3]	PQL[4 5]
Acenaphthylene (PAH)[12]	0.0028	10
Acrylonitrile[6]	0.058	5
Aldrin	0.00013	0.1[9]
Anthracane (PAH)[12]	0.0028	1.0
Atrazine[6]	3.0	0.5[10]
Benzidine	0.00012	10
Benzo (a) anthracene (PAH)[12]	0.0028	10
Benzo (a) pyrene (PAH)[12]	0.0028	10
Benzo (b) fluoranthene (PAH)[12]	0.0028	10
Benzo (k) fluoranthene (PAH)[12]	0.0028	10
Benzo (g,h,i) perylene (PAH)[12]	0.0028	10
Bromodichloromethane (HM)[7]	0.3	1.0
Bromoform (HM)[7]	4	1.0
Chlordane[11]	0.00058	1.0
Chloroform (HM)[7]	6.0	1.0
Chloroethyl ether (BIS-2)	0.03	10
Chloromethyl ether (BIS)[8]	0.0000037	10
Chlorophenol	2000	50
Chrysene (PAH)[12]	0.0028	10
DDT	0.00059	.1
Demeton	0.1	1.0[9]
Dibenzo (a,h) anthracene (PAH)[12]	0.0028	10
Dibromochloromethane (HM)[7]	6	1.0
Dichlorobenzidine	0.039	10
Dichlorophenoxyacetic acid (2,4,D)	70	1.0
Dieldrin	0.00014	0.1[9]
Dioxin (2,3,7,8 TCDD)	0.000000013	0.01[13]

Endosulfan	0.056	0.1[9]
Endrin	0.0023	0.1[9]
Fluoranthene (PAH)[12]	42	10
Fluorene (PAH)[12]	0.0028	10
Guthion	0.01	1.5
Heptachlor[11]	0.00021	0.05[9]
Hexachlorobenzene[6]	0.00072	10
Hexachlorobutadiene[6]	0.45	10
Hexachlorocyclohexane, Alpha[11]	0.0039	0.05[9]
Hexachlorocyclohexane, Beta[11]	0.014	0.05[9]
Hexachlorocyclohexane, Gamma[11]	0.019	0.05[9]
Hexachlorocyclohexane, Technical	0.012	0.2[9]
Hexachloroethane[6]	1.9	10
Indeno (1,2,3-cd) pyrene (PAH)[12]	0.0028	10
Malathion	0.1	0.2[9]
Methoxychlor	0.03	0.5[9]
Methyl bromide (HM)[7]	48	1.0
Methyl chloride (HM)[7]	5.7	1.0
Methylene chloride (HM)[7]	4.7	1.0
Mirex	0.001	0.1[9]
Napthalene (PAH)[12]	0.0028	10
Nitrosodibutylamine N[6]	0.0064	10
Nitrosodiethylamine N[6]	0.0008	10
Nitrosodimethylamine N	0.00069	10
Nitrosodiphenylamine N[6]	4.9	10
Nitrosopyrrolidine N[6]	0.016	10
Parathion[8]	0.4	
PCBs	0.000044	1
Phenanthrene (PAH)[12]	0.0028	10
Pyrene (PAH)[12]	0.0028	10
Simazine	4.0	0.5[10]
Tetrachloroethylene[6]	0.8	1.0[9]

Tetrachoroethane 1,1,2,2[6]	0.17	1
Toxaphene	0.0002	5
Trichloroethane 1,1,2[6]	0.6	1[9]
Trichlorophenol 2,4,6[11]	2.0	50[9]

1 In the absence of specific numeric standards for non-naturally occurring organics, the narrative standard "free from toxics" (section 3.1.11(1)(d)) shall be interpreted and applied in accordance with the provisions of (section 3.12.7(1)(c)(iv), so that the standard is interpreted consistently for surface and ground waters.

2 All parameters are derived from the, basin-wide tables in 5 CCR 1002-8, §§ 3.8.5(2)(a) and (e) (10-91) or the site-specific Table 1 from 5 CCR 1002-8, § 3.8.5 (3/90), except as noted.

3 The standard adopted is the statewide standard from the Basic Standards and Methodologies for Surface Water, 5 CCR 1002-8, § 3.1.0, if a statewide standard exists for the listed parameter, or is the lowest standard found in §§ 3.8.5(2)(a) and (e) (10-91), if no statewide standard exists for the listed parameter.

4 PQL's are detection levels based on the Colorado Department of Health's laboratory's best judgment for Gas Chromatography/Mass Spectrophotometry (GC/MS) unless otherwise noted.

5 The PQL adopted is the statewide PQL from the Basic Standards and Methodologies for Surface Water, 5 CCR § 3.2.0, if a statewide PQL exists for the listed parameter, or is the lowest detection level found in § 3.8.5.(2)(e) (10-91), if no statewide PQL exists for the listed parameter.

6 The standard for this parameter does not change, but the PQL differs from the GC detection limits listed in § 3.8.5(2)(e).

7 The basin-wide standards provide one standard for all halomethanes (HM). **See** 5 CCR 1002-8, § 3.8.5(2)(e) (10-91), Additional Organic Chemical Standards table. Halomethanes is actually a group of chemicals. Thus, the standard for halomethanes is deleted and the statewide standards, 5 CCR 1002-8,§ 3.1.0. (11-91), for the individual chemicals are adopted as site specific standards.

8 There is no statewide organic chemical standard for this parameter.

9 Gas Chromatography (GC) PQL.

10 PQL is not published in existing state regulations. Obtained by DOE/EG&G via personal communication with CDH.

11 Both the standard and the PQL change.

12 The original site-specific standards provided one standard for all Polynuclear Aromatic Hydrocarbons (PAH). **See,** 5 CCR 1002, § 3.8.5 (3-90), Table 1. PAH

Table 2
SITE SPECIFIC RADIONUCLIDE STANDARDS*
(in Picocuries/Liter)

The radionuclides listed below shall be maintained at the lowest practical level and in no case shall they be increased by any cause attributable to municipal, industrial, or agricultural practices to exceed the site specific numeric standards.

A. Ambient based site-specific standards:

	Segment 2 Standley Lake	Segment 3 Great Western Reservoir	Segment 4 Segment 5 Woman Creek	Segment 4 Segment 5 Walnut
Gross Alpha	6	5	7	11
Gross Beta	9	12	5	19
Plutonium	.03	.03	.05	.05
Americium	.03	.03	.05	.05
Tritium	500	500	500	500
Uranium	3	4	5	10
B. Other site-specific standard applicable to segments 2,3,4 and 5.				
Curium	244	60		
Neptunium	237	30		

*Statewide standards also apply for radionuclides not listed above.

Table 3
Temporary Modifications
Big Dry Creek, Segment 5

parameter	ug/l
carbon tetrachloride	18
tetrachloroethane	76
trichloroethylene	66
copper (TR)	23
iron (TR)	13,200
lead (TR)	28
zinc (TR)	350
manganese (D)	560
Tr = total recoverable	D = dissolved
also,	
ammonia (un-ionized)	1.8 mg/l (March 1-June 30) 0.7 mg/l (July 1-April 31)

All temporary modifications apply until April 1, 1996.

APPENDIX B
ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14 AND 16 AND LOWER SOUTH INTERCEPTOR DITCHES

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**

Parameter	Groundwater (mg/L)			Surface Water (mg/L)			Soils (mg/kg)			Sediments (mg/kg)		
	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential*** ARAR	Maximum+	Minimum++	Potential*** ARAR
METALS (TOTAL AND DISSOLVED)												
Aluminum	4.75 BR (B)	0.200	5.0	293 (A)	0.200	0.200	70600 (B)	40		24800 (A)	40	
Antimony	0.208 (E)	0.060	0.01	0.416 (A)	0.060	0.146	39.6 (G)	12	3000	42.1 (A)	12	3000
Arsenic	1.6 J BR (B)	0.010	0.05	1.03 (A)	0.010	0.05	37 (B)	2		13 (A)	2	
Barium	0.9321 (B)	0.200	1.0	87.6 (E)	0.200	1.0	1899 (B)	40	4000	300 (A)	40	4000
Beryllium	0.029 (E)	0.005	0.1	0.09 (E)	0.005	0.005	15.5 (C)	1.0	0.143	15.5 (A)	1.0	0.143
Cadmium	0.0352 BR (F)	0.005	0.01	25 (A)	0.005	0.01	27.4 (G)	1.0		2.3 (C)(E)	1.0	
Calcium	1900 BR (F)	5.000		51200 (E)	5.000		312000 (E)	2000		32000 (C)	2000	
Cesium	0.4 (G)	1.000		12 (A)	1.000		274 (C)	200				
Chromium	0.172 BR (F)	0.010	0.05	0.298 (A)	0.010	0.05	58 (C)	2.0	400 (VI)	43.38 (C)	2.0	400 (VI)
Cobalt	0.14 (E)	0.050	0.05	0.489 (A)	0.050		36 BR (E)	10		12 (C)	10	
Copper	0.9515 (E)	0.025	1.0	0.908 (E)	0.025	1.0	30.62 (C)	5.0		40.4 (A)	5.0	
Iron	57.1 (F)	0.100	0.3	3220 (A)	0.100	0.30	67200 BR (E)	20		33300 (A)	20	
Lead	0.21 J BR (B)	0.005	0.05	0.516 (A)	0.005	0.050	45.8 (C)	1.0		66.4 (A)	1.0	
Lithium	0.7 (E)	0.100		85.2 (A)	0.100		47 (E)	20		27.8 (C)(E)	20	
Magnesium	788 (F)	5.000		7540 (E)	5.000		6490 BR (E)	2000		5970 (A)	2000	
Manganese	6 (F)	0.015	0.05	27.7 (A)	0.015	0.050	3540 (C)	3.0		1390 (A)	3.0	
Mercury	0.006 (E)	0.0002	0.002	3.97 (E)	0.0002	0.002	114 (C)	0.2		0.72 (C)	0.2	
Molybdenum	1.92 BR (B)	0.200		0.333 (A)	0.200		38.65 (C)	40		42 (E)	40	
Nickel	11.7 (E)	0.040	0.2	0.646 (A)	0.040	0.1	71 BR (E)	8.0	2000	34 (C)	8.0	2000
Potassium	633 BR (F)	5.000		4260 (A)	5.000		4440 (G)	2000		67000 (E)	2000	
Selenium	3.2 (E)	0.005	0.010	0.55 (A)	0.005	0.010	1.5 (C)	1.0		21.3 (A)	1.0	
Silicon	10.7 (F)											

* = Present in laboratory blank
** = No data available for OU9 or OU15 at the present time
*** = These are based on human health and environmental risk assessment criteria developed for screening purposes as discussed in Section 4.2, or applicable state or federal requirements.
J = Analyzed below detection limit
BR = Bedrock (including some weathered bedrock)
\+ = Maximum concentration may be a one-time measurement. Values include both recent and historic data. Letter in parentheses indicates reference source from list at end of table.
\+ + = Value given is detection or quantitation limit for analysis, in accordance with Statement of Work for General Radiochemistry and Routine Analytical Services Protocol (G.R.R.A.S.P.), v.1.1, 1990, EG&G Rocky Flats Environments Restoration Program.
(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

Taken from: EG&G (1991). Final Treatability Studies Plan. August 1991.

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (mg/L)			Surface Water (mg/L)			Soils (mg/kg)			Sediments (mg/kg)		
	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential*** ARAR	Maximum+	Minimum++	Potential ARAR
METALS (TOTAL AND DISSOLVED) (Continued)												
Silver	0.13 (B)	0.010	0.050	0.148 (A)	0.010	0.050	40.9 (C)	2.0	200	49.1 (A)	2.0	200
Sodium	924 (F)	5.000		17300 (E)	5.000		3680 (C)	2000		670 (E)	2000	
Strontium	7.7 BR (B)	0.200		11.9 (A)	0.200		226 (C)	40		179 (E)	40	
Thallium	0.016 (E)	0.050								13 (E)	2.0	
Tin	1.121 (E)	0.200		1.53 (A)	0.200		33.8 (C)	40		1080 (A)	40	
Vanadium	0.092 BR (B)	0.050		1.65 (A)	0.050		108 (C)	10		58.4 (C)	10	
Zinc	4.39 BR (F)	0.020	5.0	28.7 (E)	0.020	5.0	195 (G)	4.0		735 (C)	4.0	

* = Present in laboratory blank
** = No data available for OU9 or OU15 at the present time
*** = These are based on human health and environmental risk assessment criteria developed for screening purposes as discussed in Section 4.2, or applicable state or federal requirements.
J = Analyzed below detection limit
BR = Bedrock (including some weathered bedrock)
\+ = Maximum concentration may be a one-time measurement. Values include both recent and historic data. Letter in parentheses indicates reference source from list at end of table.
\+ + = Value given is detection or quantitation *limit for analysis, in accordance* with Statement of Work for General Radiochemistry and Routine Analytical Services Protocol (G.R.R.A.S.P.), v.1.1, 1990, EG&G Rocky Flats Environme Restoration Program.
(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (mg/L)				Surface Water (mg/L)				Soils (mg/kg)				Sediments (mg/kg)			
	Maximum+		Minimum++	Potential ARAR	Maximum+		Minimum++	Potential ARAR	Maximum+		Minimum++	Potential*** ARAR	Maximum+		Minimum++	Potential*** ARAR
ANIONS																
Bicarbonate as $CaCO_3$	1100	(F)	10		1900	(A)	10									
Carbonate as $CaCO_3$	505	BR (B)	10		270	(A)	10									
Chloride	960	BR (F)	5	250	960	(A)	5	250								
Cyanide	10.2	(E)	10	10	21	J (E)	10	10	6.8	(E)						
Fluoride	1.7	(G)	5	5												
Nitrate as N	15.5	(C)	5	10	18593	(A)	5	10	4.3	(C)			35.86	(A)		
Nitrate + Nitrite as N	5000	(F)	5	10	9900	(A)	5	10	180	(G)			13	(A)		
Nitrite as N					24	(A)	5	5								
Sulfate	1900	(F)	5	250	1900	(E)	5	250								
Sulfide					120	(A)			13	(C)	4					

* = Present in laboratory blank
** = No data available for OU9 or OU15 at the present time
*** = These are based on human health and environmental risk assessment criteria developed for screening purposes as discussed in Section 4.2, or applicable state or federal requirements.
J = Analyzed below detection limit
BR = Bedrock (including some weathered bedrock)
\+ = Maximum concentration may be a one-time measurement. Values include both recent and historic data. Letter in parentheses indicates reference source from list at end of table.
\+\+ = Value given is detection or quantitation limit for analysis, in accordance with Statement of Work for General Radiochemistry and Routine Analytical Services Protocol (G.R.R.A.S.P.), v.1.1, 1990, EG&G Rocky Flats Environmental Restoration Program.
(a) = Plutonium 238+239+240
(b) = Radium 226+228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (mg/L)			Surface Water (mg/L)			Soils (mg/kg)			Sediments (mg/kg)		
	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential*** ARAR	Maximum+	Minimum++	Potential** ARAR
INDICATORS												
Conductivity Min. (umho/cm)				73.7 (A)	1							
Conductivity Max. (umho/cm)				37120 (A)	1							
Dissolved Oxygen (mg/L)												
Minimum				0 (A)								
Maximum				70 (A)	0.5							
Oil and Grease	6.7 (G)			321 (G)	5					2200 (A)		
Percent Solids (%)												
Minimum							78.9 (G)			14.7 (A)		
Maximum							96.4 (G)			96.4 (A)		
pH minimum (pH units)	5.98 (C)	0.1	6.5	3.4 (A)	0.1	6.5	5.65 (E)			6.1 (A)		
pH maximum (pH units)	12 (F)	0.1	8.5	10.2 (A)	0.1	8.5	10.14 (C)			9.03 (C)		
Temperature (degrees C)												
Minimum				2 (A)								
Maximum				33 (A)								
Total Dissolved Solids (mg/L)	22000 (F)	10	500	41000 (A)	10	500						
Total Suspended Solids (mg/L)	1800 (F)	5		7600 (A)	5							

* = Present in laboratory blank
** = No data available for OU9 or OU15 at the present time
*** = These are based on human health and environmental risk assessment criteria developed for screening purposes as discussed in Section 4.2, or applicable state or federal requirements.
J = Analyzed below detection limit
BR = Bedrock (including some weathered bedrock)
\+ = Maximum concentration may be a one-time measurement. Values include both recent and historic data. Letter in parentheses indicates reference source from list at end of table.
\+ + = Value given is detection or quantitation *limit for analysis, in accordance* with Statement of Work for General Radiochemistry and Routine Analytical Services Protocol (G.R.R.A.S.P.), v.1.1, 1990, EG&G Rocky Flats Environment Restoration Program.
(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (pCi/L)			Surface Water (pCi/L)			Soils (pCi/g)			Sediments (pCi/g)		
	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential*** ARAR	Maximum+	Minimum++	Potential*** ARAR
RADIONUCLIDES (TOTAL AND DISSOLVED)												
Americium 241	2.3 (E)	0.01		90 (A)	0.01	30	2273 (B)	0.02		0.04 (E)	0.02	
Cesium 137	3.1 (E)	1		25 (E)	1		3.1 (B)	0.1		3.2 (A)	0.1	
Gross Alpha	811 BR (E)	2	15	1900 (A)	2	15	480 (B)	4	5	77 (A)	4	5
Gross Beta	368 (F)	4	50	3800 (A)	4	5	49.9 (G)	10	50	50 (C)	10	50
Plutonium 239 + 240	4.6 (G)	0.01	15(a)	120 (A)	0.01	15(a)	20455 (B)	0.03	0.9	3.3 (A)	0.03	0.9
Radium 226	0.8 (E)(G)	0.5		30 (A)	0.5	5(b)	1.6 (G)	0.5		1.3 (C)	0.5	
Radium 228				24 (A)	0.5	5(b)	2.6 (G)	0.5		2.3 (A)	0.5	
Strontium 89 + 90	4.59 (G)	1.0		37 (C)	1.0		1.9 (E)	1		0.5 (C)	1	
Strontium 90	5.7 (G)	1.0	8	3.2 (A)	1.0	8	1.41 (G)	1		0.99 (A)	1	
Tritium	7710 (F)	400	20000	13000 (A)	400	500	3260 (G)	400		580 (E)	400	
Uranium 233 + 234	723 (G)	0.6		861 (A)	0.6		60 (E)	0.3		2.1 (A)	0.3	
Uranium 235	9 (F)	0.6		65.5 (A)	0.6		1.01 (G)	0.3		1.34 (A)	0.3	
Uranium 235 + 236	0.009 (G)	0.6		1.192 (G)	0.6							
Uranium 238	190 (F)	0.6		366 (A)	0.6		3000 (E)	0.3		2.7 (C)(A)(E)	0.3	
Uranium (Total)	63.7 (B)	0.6		1023 (A)	0.6	5	4 BR (E)	0.3		4.8 (E)	0.3	

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\+ + = Value given is detection or quantitation limit for analysis, in accordance with Statement of Work for General Radiochemistry and Routine Analytical Services Protocol (G.R.R.A.S.P.), v.1.1, 1990, EG&G Rocky Flats Environmental Restoration Program.
(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (ug/L)			Surface Water (ug/L)			Soils (ug/kg)			Sediments (ug/kg)		
	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential*** ARAR	Maximum+	Minimum++	Potential*** ARAR
VOLATILES												
1,1-Dichloroethane	344 (E)	5		50 (A)	5		32 (C)	5				
1,1-Dichloroethene	48000 (E)	5	7	143 (C)	5	7	110 (C) *	5	12000			
1,1,1-Trichloroethane	30250 (E)	5	200	42 (C)	5	200	250 (B)	5	7000000			
1,1,2-Trichloroethane	14740 (E)	5	28				62 (C)	5	120000			
1,1,2,2-Tetrachloroethane				440 (G)	5							
1,2-Dichloroethane	16000 (E)	5	5				120 (B)	5	7700			
1,2-Dichloroethene (Total)	5070 (E)	5	70	56 (C)	5	70	140 (C)	5				
1,2-Dichloropropane	5 (F)	5	5									
1,3-Dichloropropene							6 J (C)	5	3900			
2-Butanone	110 (G)	10		24 (E) *	10		390 (E)	10		12 (C)	10	
2-Chloroethylvinylether							31 J (B)	10				
2-Hexanone	975 (B)	10										
4-Methyl-2-Pentanone	35 (B)	10		15 (A)	10		68 BR (E)	10		220 (E) *	10	
Acetone	1300 (B)	10	4000	180 (A)	10	4000	2400 (C) *	10	8000000	220 (E)	10	800000
Benzene	83 J (E)	5	5	83 (A)	5	5						
Bromodichloromethane				2 J (C)	5							
Bromomethane	7 J (G)											
Carbon Disulfide	21 (G)	5		19 (A)	5		40 (G)			6 J (E)	5	
Carbon Tetrachloride	28000 (E)	5	5	1005 (C)	5	5	180 (C)*	5	5400			
Chlorobenzene				94 (A)	5	100	150 (C)	55				

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(a) = Plutonium 238+239+240
(b) = Radium 226+228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (ug/L)			Surface Water (ug/L)			Soils (ug/kg)			Sediments (ug/kg)		
	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential*** ARAR	Maximum+	Minimum++	Potential*** ARAR
VOLATILES (Continued)												
Chloroethane	17 (F)	10		20 (A)	10		50 J (B)	10				
Chloroform	5427 (B)	5	100	82 (A)	5	100	130 J (B)	5	110000	18 (C)	5	110000
Chloromethane	4J (G)			12.5 (A)	10					60 (E)	10	
Ethylbenzene	6 (E)	5	680	12.5 (A)	5	1400	780 (B)	5	8000000	1 J (C)	5	8000000
Methylene Chloride	1500 (E) *	5	5	44 (C)	5	5	590 BR (E)	5	93000	22 (E)	5	93000
Styrene	9 (B)	5					17 J (B)	5				
Tetrachloroethene	528000 (B)	5	10	280 (A)	5	5	10000 (B)	5	140000	8 (C)	5	140000
Toluene	270 J (E) *	5	2420	12 (E)	5	14300	640 (B)	5	20000000	6 J (E)	5	20000000
Trichloroethene	221860 (B)	5	5	2500 (C)	5	5	17000 (B)	5	64000	39 (C)	5	64000
Vinyl Acetate	39 J (E)											
Vinyl Chloride	930 (B)	10	10	25 (A)	10	10				5 J (C)	10	
Xylenes (Total)	4 J (B)	5	7000	13 (A)	5	7000	3300 (B)	5	200000000	7 J (C)	5	200000000

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(a) = Plutonium 238 + 239 + 240
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ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Continued)

Parameter	Groundwater (ug/L)			Surface Water (ug/L)			Soils (ug/kg)			Sediments (ug/kg)		
	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential ARAR	Maximum+	Minimum++	Potential*** ARAR	Maximum+	Minimum++	Potential*** ARAR
SEMIVOLATILES (TOTAL, UG/L)												
Acenaphthene							57 J (E)	330				
Anthracene							81 J (E)	330				
Benzo (a) Anthracene							110 J (E)	330	224			
Benzo (b) Fluoranthene							89 J (E)	330				
Benzo (k) Fluoranthene							280 J (E)	330				
Benzo (g,h,i) Perylene							50 J (E)	330				
Benzo (k) Pyrene							130 J (E)	330				
Bis (2-ethylhexyl) Phthalate	100 J BR (D)	10	10	220 (A)	10	15000	8700 (C) *	330	83000			
Chrysene							91 J (E)	330				
Diethyl Phthalate							29 (E)	330	60000000			
Di-n-Butyl Phthalate	170 J BR (D)	10	4.0				3643 (E)	330	8000000			
Di-n-Octyl Phthalate	56 J BR (D)	10					265 (E)	330				
Fluoranthene							290 J (E)	330				
Fluorene							350 (E)	330				
Indeno (1,2,3-cd) Pyrene							47 (E)	330				
2-Methylnaphthalene				15 (A)	10							
2-Methylphenol				43 (A)	10							
N-Nitrosodiphenylamine	100 J BR (D)	10					370 (B) *	330				
Phenanthrene							370 (E)	330				

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J = Analyzed below detection limit
BR = Bedrock (including some weathered bedrock)
\+ = Maximum concentration may be a one-time measurement. Values include both recent and historic data. Letter in parentheses indicates reference source from list at end of table.
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(a) = Plutonium 238 + 239 + 240
(b) = Radium 226 + 228

ANALYTE CONCENTRATIONS FOR COMBINED OPERABLE UNITS 1-8, 10-14, AND 16 AND UPPER AND LOWER SOUTH INTERCEPTOR DITCHES**
(Concluded)

Parameter	Groundwater (ug/L)			Surface Water (ug/L)			Soils (ug/kg)			Sediments (ug/kg)		
	Maximum*	Minimum**	Potential ARAR	Maximum*	Minimum**	Potential ARAR	Maximum*	Minimum**	Potential*** ARAR	Maximum*	Minimum**	Potential*** ARAR
SEMI-VOLATILES (TOTAL, UG/L) (Continued)												
Phenol				18 (A)	10	3500						
Pyrene							270 J (E)	330				

REFERENCES:

NOTE: Analytical data received prior to October 1988 not subjected to validation procedure. Some of the contaminant values reported in this table have not yet been validated, and the analyte list may be changed after the data are validated.

(A) EG&G. February 22, 1991a, Surface Water and Sediment Geochemical Characterization Report, Draft Copy
(B) U.S. DOE. April 2, 1990c, Final Phase II Remedial Investigation/Feasibility Study Workplan (Alluvial), OU2, Draft Copy
(C) U.S. DOE. January 11, 1991a, Proposed Surface Water Interim Measures, Interim Remedial Action Plan/Environmental Assessment and Decision Document South Walnut Creek Basin, OU2, Final Draft
(D) U.S. DOE. January 24, 1991b, Phase II Remedial Investigation/Feasibility Study Workplan (Bedrock), OU2, Draft Copy
(E) U.S. DOE. October, 1990d, Phase III Remedial Investigation/Feasibility Study Workplan 881 Hillside Area, OU1, Final Draft
(F) EG&G. March 1, 1991b, 1990 Annual RCRA Groundwater Monitoring Report for Regulated Units at Rocky Flats Plant, Draft Copy
(G) EG&G. May, 1991, Unpublished data (See NOTE to references)

* = Present in laboratory blank
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APPENDIX C
CURRENT SURFACE WATER AND SEDIMENT SAMPLING AND MONITORING REQUIREMENTS

APPENDIX C

TABLE OF CONTENTS

Table 1.--Summary of NPDES/FFCA Compliance Sampling.		
LOCATION	ANALYTES	FREQUENCY
Pond A-3	Nitrate	daily during discharge
	Flow	daily during discharge
Pond B-3	5-Day Biological Oxygen Demand (BOD5)	daily
	Total Suspended Solids (TSS)	daily
	Nitrate	daily
	Total Residual Chlorine (TRC)	daily
	Flow	daily
Pond A-4	Whole Effluent Toxicity (WET)	quarterly at discharge
	Non-Volatile Suspended Solids (NVSS)	daily during discharge
	Total Chromium	monthly during discharge
	Flow	daily during discharge
STP	pH	daily during discharge
	Total Residual Chlorine (TRC)	daily during discharge
	Total Suspended Solids (TSS)	three times per week
	Fecal Coliform	three times per week
	Total Phosphorous	three times per week
	Carbonaceous 5-Day BOD	three times per week
	Flow	daily
	Visible Oil and Grease	daily
	Target Analyte List Metals	two times per month
	Volatile Organic Analytes (CLP)	two times per month
	Total Chromium	weekly
	Whole Effluent Toxicity (WET)	quarterly
Pond B-5	Total Residual Chlorine (TRC)	daily during discharge when
		Pond B-3 is bypassed
	Nitrate	Same as TRC
	Whole Effluent Toxicity	quarterly at discharge
	Non-Volatile Suspended Solids	daily during discharge
	Total Chromium	monthly at discharge
	Flow	daily during discharge
Pond C-2	Whole Effluent Toxicity (WET)	quarterly at discharge
	Non-Volatile Suspended Solids (NVSS)	daily during discharge
	Total Chromium	monthly at discharge
	Flow	daily during discharge

Taken from: EG&G (1993). RFP Surface Water and Sediment Monitoring Program Summary. January 1993.

Table 2.--Summary of Agreement in Principle (AIP) Compliance Sampling.		
LOCATION	ANALYTES	FREQUENCY
Pond A-3	Plutonium, Uranium, Americium	weekly composite
	Tritium	daily during discharge
	gross alpha/beta	daily during discharge
	pH	daily during discharge
	Field Parameters	daily during discharge
Pond A-4	Plutonium, Uranium, Americium	weekly composite
	Tritium	daily during discharge
	gross alpha/beta	daily during discharge
	pH	daily during discharge
	Nitrate	daily during discharge
	Tot. Suspended Solids/Tot. Dissolved Solids	daily during discharge
	Field Parameters	daily during discharge
Pond B-5	Plutonium, Uranium, Americium	weekly composite
	Tritium	daily during discharge
	gross alpha/beta	daily during discharge
	pH	daily during discharge
	Nitrate	daily during discharge
	Tot. Suspended Solids/Tot. Dissolved Solids	daily during discharge
	Field Parameters	daily during discharge
Pond C-2	Plutonium, Uranium, Americium	weekly composite
	Tritium	daily during discharge
	gross alpha/beta	daily during discharge
	pH	daily during discharge
	Nitrate	daily during discharge
	Tot. Suspended Solids/Tot. Dissolved Solids	daily during discharge
	Field Parameters	daily during discharge
Ponds A-4	TSS,TDS, Anions, Nitrate, Alkalinity	Predischarge Splits with
B-5, & C-2	Gross alpha/beta	Colorado Department of
	Total Radionuclides (Pu, U, Am, etc.)	Health (CDH), and weekly
	Semivolatile Organic Analytes (Method 625)	splits with CDH during
	Volatile Organic Analytes (Method 502.2)	discharge.
	Pesticides (Method 608)	
	Herbicides (Method 615)	
	Triazine Herbicides	
	Total and Dissolved Metals (TAL-CLP)	
Building 124	Plutonium, Uranium, Americium	monthly composite
Raw Water	TSS, TDS, Anions, Nitrate, Alkalinity	weekly

Taken from: EG&G (1993). RFP Surface Water and Sediment Monitoring Program Summary. January 1993.

Table 3.--Summary of Operational Monitoring for DOE Orders.		
LOCATION	ANALYTES	FREQUENCY
STP	Gross alpha/beta	daily
Effluent	Nitrate	daily
	Chemical Oxygen Demand	daily
	Total Organic Carbon	daily
	Dissolved Oxygen	daily
	Tritium	daily
	Amonia	daily
	Hardness	daily
	Plutonium, Americium, Uranium	daily
	Field Parameters	daily
STP	Gross alpha/beta	daily
Influent	pH	daily
	Chemical Oxygen Demand	daily
	Total Organic Carbon	daily
	Dissolved Oxygen	daily
	Total Kjeldahl Nitrogen	daily
	Amonia	daily
	Carbonaceous 5-Day Biological Oxygen Demand	three times per week
	Volatile Organic Analytes (CLP)	two times per month
	Field Parameters	daily
Pond A-4	Plutonium, Uranium, Americium	weekly when not discharging
Pond C-2	Plutonium, Uranium, Americium	weekly, 4 weeks prior to
		discharge
Pond C-1	Gross alpha/beta	daily
	Flow	daily
	Tritium	daily
	Plutonium, Uranium, Americium	weekly composites
	Field Parameters	daily
750/904	gross alpha/beta	during precipitation events
Pad	pH	during precipitation events
Runoff	Nitrate	during precipitation events
	Cyanide	during precipitation events
	Target Analyte List Metals plus Mercury	during precipitation events
	Volatile Organic Analytes (CLP)	during precipitation events
	Amonia	during precipitation events
	Field Parameters	during precipitation events

Taken from: EG&G (1993). RFP Surface Water and Sediment Monitoring Program Summary. January 1993.

Table 3.--Continued		
LOCATION	ANALYTES	FREQUENCY
750 Culvert	gross alpha/beta	weekly
	Total Dissolved Solids	weekly
	Nitrate	weekly
	Tritium	weekly
	pH	weekly
	Field Parameters	weekly
Footing	Gross alpha/beta	quarterly
Drains&	Tritium	quarterly
Building	pH	quarterly
Sumps	Target Analyte List Metals	quarterly
(18 sites)*	Volatile Organic Analytes (method 524.2)*	Three quarterly samples initially, on an as-needed basis thereafter, minimum of annual analysis*
	Semi-Volatile Organic Analytes (CLP)*	
	Field Parameters (conductivity, temperature)*	quarterly
	TDS, Total Nitrates*	quarterly *
Building 124	Volatile Organic Analytes	bi-annually
Water	Unregulated Organics	quarterly
Treatment	gross alpha/beta	quarterly
Plant (Safe	Nitrate	annually, February
Drinking	Strontium-90	annually, February
Water Act)	Tritium	annually, February
	Metals	annually
	Anions, Alkalinity	annually
	Corrosivity	bi-annually
	Copper and Lead	Monthly July to December
	Micro Coliform	monthly
Onsite Tap	Total Coliform	quarterly
Water		
(SDWA)		
30 Sites		

*Changes as per telecom with Leslie Dunstan on November 18, 1993.

Taken from: EG&G (1993). RFP Surface Water and Sediment Monitoring Program Summary. January 1993.

Table 4.--Summary of Surface-Water and Sediment Sampling for the Los Alamos National Laboratory (LANL) Research Program.		
LOCATION	ANALYTES	FREQUENCY
Sewage Treatment Plant, Pond A-4, Pond B-5, Pond C-2	LANL LIST	Monthly
Pond A-1, Pond A-2, Pond A-3, Pond B-1, Pond B-2, Pond B-3, Pond B-4, Pond C-1	LANL LIST	Quarterly
Stream Water per Project Manager	LANL LIST	40 per year
Sediment Samples per Project Manager	LANL LIST	40 per year

Taken from: EG&G (1993). RFP Surface Water and Sediment Monitoring Program Summary. January 1993.

Table 6.–Sample Volume, Container, and Preservation Requirements for Analytes in the Event-Related Surface-Water Monitoring Program.

Class of Analytes	Volume of Individual Samples from Auto-sampler	Volume Required for Analytical Methods	Preservative	Container	Analytical Methods
Total Target Analyte List (TAL) Metals	1 Liter	100 ml	Nitric Acid to pH<2	Polyethylene	CLP-Metals SW846-GFAA
Total Non-TAL Metals	1 Liter	100 ml	Nitric Acid to pH<2	Polyethylene	CLP & SW846 ICPAES & GFAA
Total Radionuclides	4 Liters	4 Liters	Nitric Acid to pH<2	Polyethylene	GRRASP
-Pu, U, Am					
-Gross Alpha					
-Gross Beta					
-Tritium (only at GS11, GS12, and GS13)					
Water-Quality Parameters					
-Anions	1 Liter for	1 Liter plus	Cool to 4 degrees	Polyethylene	300.0
-Alkalinity	all con-	250 ml	"	Polyethylene	310.1
-Conductivity	stituents		"	Polyethylene	120.1
-TSS,TDS	plus 250 ml		"	Polyethylene	160.1,160.2
Nitrate/Nitrite - N	for Total P.		"	Polyethylene	353.1
-Total P			"	Polyethylene	365
BOD	2 Liters	2 liters	Cool to 4 degrees	Poly or Glass	SW846
VOAs (Manually Collected)	120 ml*	3x40ml	Cool to 4 degrees HCl to pH<2	Glass VOA Vial	CLP 502.2
TCL Semi-VOAs (Manually Collected)	2 L*	2x1 L	Cool to 4 degrees	Amber Glass	624
Pesticides/PCB (Manually Collected)	350 ml	350 ml	Cool to 4 degrees	Amber Glass	505

[GRRASP = General Radiochemistry and Routine Analytical Services Protocol]

*Changes as per written instructions by Greg Wetherbee on November 4, 1992.

Taken from: EG&G (1993). RFP Surface Water and Sediment Monitoring Program Summary. January 1993.

APPENDIX D
SUPPLEMENTAL INFORMATION FOR RISK ASSESSMENT

APPENDIX D

TABLE OF CONTENTS

SUPPLEMENTAL INFORMATION FOR RISK ASSESSMENT (GENERAL)

APPENDIX D
SUPPLEMENTAL INFORMATION FOR RISK ASSESSMENT

This appendix contains supplemental information regarding calculation of RfDo's, background studies and models for chemical carginogency, and effects of radiation on human health.

Calculation of Reference Doses

Oral Reference Dose (RfDo) values (in units of milligrams per kilograms per day [mg/kg/day]) are typically calculated by dividing a NOEL, NOAEL, or LOAEL dose (in units of mg/kg/day) by an uncertainty or safety factor that typically ranges from 10 to 10,000. Thereafter, the RfDo is rounded to one significant figure. The NOEL, NOAEL, and LOAEL are defined as follows:

NOEL: No Observed Effect Level–The dose at which there are no statistically or biologically significant increases in the frequency or severity of effects between the exposed population and the corresponding control population (i.e., no measurable effects are produced at this dose).

NOAEL: No Observed Adverse Effect Level–The dose at which there are no statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and the corresponding control population. Effects are produced at this dose, but they are not considered adverse.

LOAEL: Lowest Observed Adverse Effect Level–The lowest dose of a chemical in a study or group of studies that produces statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its appropriate control.

RfDo values are derived from the NOEL, NOAEL, or the LOAEL for the critical toxic effect by the consistent, conservative application of uncertainty factors (UFs) and modifying factors (MFs), as follows:

$$\text{RfDo} = \text{CE}/(\text{UF} \times \text{MF}) \tag{1}$$

where:

RfDo = Chronic (or subchronic) Oral Reference Dose (rounded to one significant figure)
CE = Lowest critical or no effect level (i.e., NOEL, NOAEL, or LOAEL)
UF = The product of one or more uncertainty factors
MF = Modifying factor

UFs are generally applied as multiples of 10 (although values less than 10 are sometimes used), with each factor representing a specific range of uncertainty inherent in extrapolating data to derive a "safe concentration" for human exposure.

To derive the RfDo values, UFs are applied as follows:

- If the NOAEL is based on human data, a UF of 10 is usually applied to account for variation in sensitivities among individuals. It is intended to protect sensitive subpopulations (e.g., the elderly and children).

- If the NOAEL is based on animal data, an additional UF of 10 is used to account for the interspecies variability between humans and other animals.

- If the NOAEL is derived from a subchronic instead of a chronic study, an additional UF of 10 is applied to extrapolate a subchronic value to a chronic value.

- If an LOAEL is used instead of an NOAEL, an additional UF of 10 is used to account for the uncertainty associated with extrapolating from LOAELs to NOAELs.

In addition to the UFs listed above, an MF can be arbitrarily applied. MFs range from 1 to 10 and reflect a qualitative professional assessment of additional uncertainties not specifically addressed by the above-mentioned UFs. The default MF value is 1.0.

Background Studies and Models for Chemical Carcinogenicy

Evidence of chemical carcinogenicity originates primarily from two sources: lifetime studies with laboratory animals and human (epidemiological) studies. For most chemical carcinogens, animal data from laboratory experiments represent the primary basis for the extrapolation. Major assumptions arise from the necessity of extrapolating experimental results: across species (from laboratory animals to humans); from high-dose regions (to which laboratory animals are exposed) to low-dose regions (levels to which humans are likely to be exposed in the environment); and, across routes of administration (inhalation versus ingestion). Federal regulatory agencies have traditionally estimated human cancer risks associated with exposure to chemical carcinogens on the administered-dose basis according to the following approach:

- The relationship between the administered dose and the incidence of cancer in animals is based on experimental animal bioassay results.

- The relationship between the administered dose and the incidence of cancer in the low-dose range is based on mathematical models.

- The dose-response relationship is assumed to be the same for both humans and animals, if the administered dose is measured in the proper units.

Thus, effects from exposure to high (administered) doses are based on experimental animal bioassay results, while effects associated with exposure to low doses of a chemical are generally estimated from mathematical models.

For chemical carcinogens, EPA assumes a small number of molecular events can evoke changes in a single cell that can lead to uncontrolled cellular proliferation and tumor induction. This mechanism for carcinogenesis is referred to as stochastic, which means that there is theoretically no level of exposure to a given chemical that does not pose a small, but finite, probability of generating a carcinogenic response. Since risk at low exposure levels cannot be measured directly either in laboratory animals or human epidemiology studies, various mathematical models have been proposed to extrapolate from high to low doses (i.e., to estimate the dose-response relationship at low doses). The three most frequently used models are the one-hit model, the log-probit model, and the multistage model. The one-hit model is based on the premise that a single molecule of a contaminant can be the single event that precipitates tumor induction (Cornfield, 1977). In other words, there is some finite response associated with any exposure. The log-probit model assumes that a response is normally distributed with the logarithm of the dose (Mantel et al., 1971).

This theory seems to have little scientific basis, although some physiological parameters are lognormally distributed. This model usually yields much lower potency estimates due to the implied threshold at lower doses.

Currently, regulatory decisions are based on the output of the linearized multistage model. The basis of the linearized multistage model is that multiple events (versus the single-event paradigm of the one-hit model) may be needed to yield tumor induction. The linearized multistage model reflects the biological variability in tumor frequencies observed in animals or human studies. The dose-response relationship predicted by this model at low doses is essentially linear. Use of this model provides dose-response estimates intermediate between the one-hit and the log-probit models. It should be noted that the slope factors (SFs) calculated for nonradiological carcinogens using the multistage model represent the 95th percentile upper confidence limit on the probability of a carcinogenic response. Consequently, risk estimates based on these SFs are conservative estimates representing upper-bound estimates of risk where there is only a 5 percent probability that the actual risk is greater than the estimated risk.

Most models produce quantitatively similar results in the range of observable data, but yield estimates that can vary by three or four orders of magnitude at lower doses. Animal bioassay data are simply not adequate to determine whether any of the competing models are better than the others. Moreover, there is no evidence to indicate that the precision of low-dose risk estimates increases through the use of more sophisticated models. Thus, if a carcinogenic response occurs at the exposure level studied, it is assumed that a similar response will occur at all lower doses, unless evidence to the contrary exists.

For radionuclides, human epidemiological data collected from the survivors of the Hiroshima and Nagasaki bomb attacks form the basis for the most recent extrapolation put forth by the National Academy of Science (1980). Conversely, for most nonradiological carcinogens, animal data from laboratory studies represent the primary basis for the extrapolation. Furthermore, in the past, risk factors for radionuclides have generally been based on fatalities (i.e., the number of people who actually died from cancer), while SFs for nonradiological carcinogens are based on incidence (i.e., the number of people who developed cancer).

Effects of Radiation on Human Health

Ionizing radiation has sufficient energy to interact with matter and produce an ejected electron and a positively charged ion. These positively charged ions, known as free radicals, are highly reactive and may combine with other elements or compounds within a cell to produce toxins or otherwise disrupt the chemical balance, which results in mutations or other deleterious effects. Radionuclides are characterized by the type and energy level of the radiation emitted. Radiation emissions fall into two major categories: particulate (electrons, alpha particles, beta particles, protons) or electromagnetic (gamma and x-rays) radiation.

The general health effects of radiation can be divided into stochastic and nonstochastic effects, i.e., those health effects related to dose and those not related to the dose. The risk of developing of cancer from exposure to any amount of radiation is a stochastic effect. Examples of nonstochastic effects include acute radiation syndrome and cataract formation, both of which occur only at high levels of exposures.

Radiation can damage cells in different ways. First, the radiation can cause damage to the strands of genetic material, DNA, in the cell. The cell may not be able to recover from this type of damage, or the cell may live on but function abnormally. If the abnormally functioning cell divides and reproduces, a tumor or mutation in the tissue may develop. The rapidly dividing cells that line the intestines and the stomach and the cells that make blood in the bone marrow are very sensitive to this kind of damage. Organ damage results from the damage caused to the individual cells. This type of damage has been reported with doses of 10 to 500 rads. Acute radiation sickness is seen only after doses of greater than 50 rads. This dose is usually only received by personnel in close proximity to serious nuclear accident.

When the cells damaged by radiation are reproductive cells, genetic damage can occur in the offspring of the person exposed. The developing fetus is especially sensitive to radiation. The type of malformation that may occur is related to the stage of fetal development and the cells that are differentiating at the time of exposure. Radiation damage to children exposed while in the womb is related to the dose the pregnant mother received. Mental retardation is another possible effect of fetal radiation exposure.

APPENDIX D
SUPPORTING STATISTICAL INFORMATION FOR RISK ASSESSMENT

APPENDIX D
SUPPORTING STATISTICAL INFORMATION FOR RISK ASSESSMENT

All information in this introduction and appendix was excerpted or summarized directly from the following EG&G Statistical Application Reports created for the pond water quality risk assessment:

SA-93-012 Statistical Determination of Proposed Contaminants of Concern for the Pond Water Quality IM/IRA. June 7, 1993.

SA-93-014 Summary Statistics for the Pond Water Quality IM/IRA. July 30, 1993.

SA-93-015 Summary Statistics in Support of the Risk Assessment for the Pond Water Quality IM/IRA. July 30, 1993.

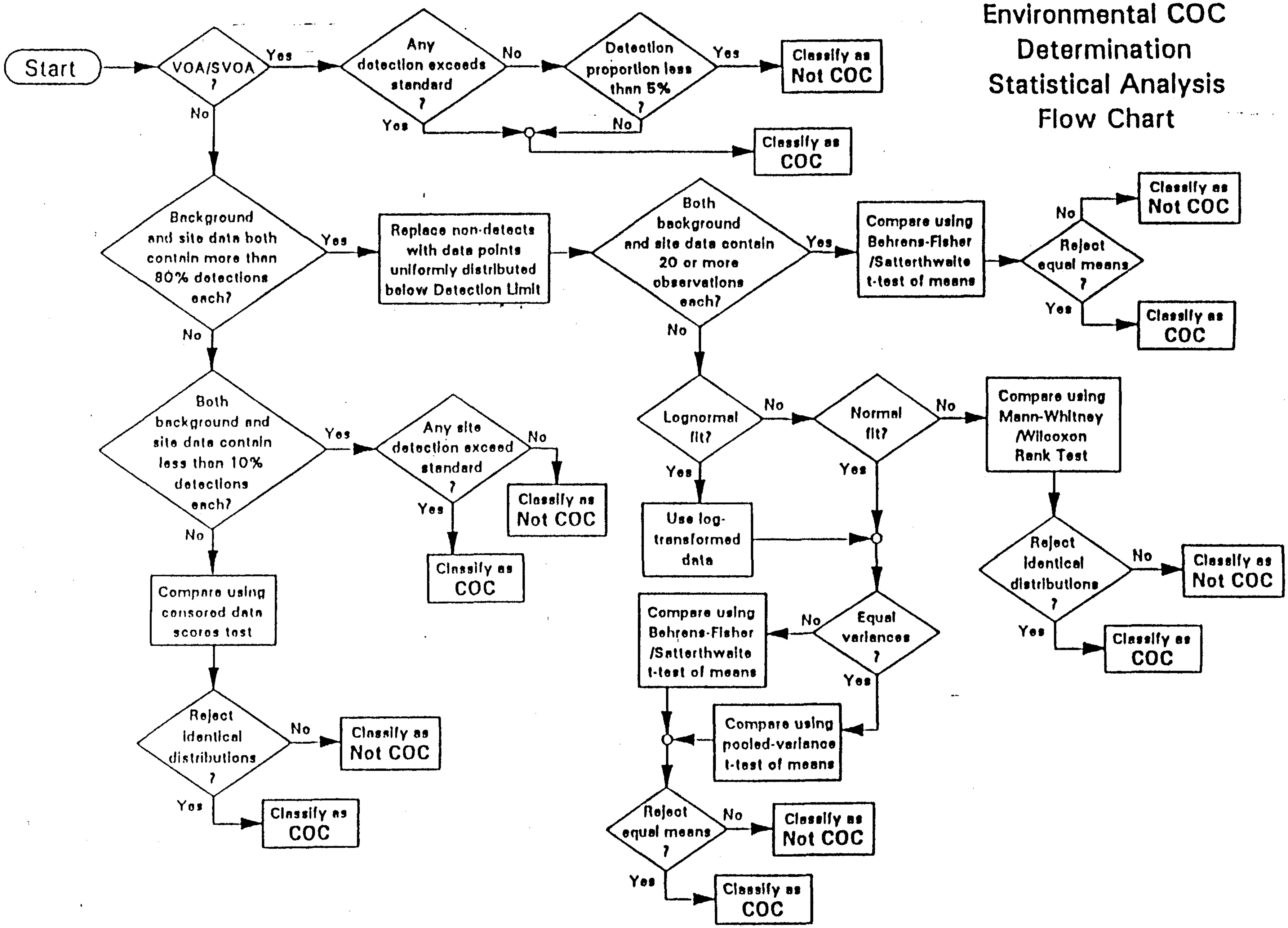
Determination of Proposed Contaminants of Concern (PCOCs)

PCOCs were identified in pond water through a statistical comparison of background and site data. If levels of an analyte were statistically significantly greater in the site data, the analyte was classified as a PCOC and used in the risk assessment process described in Section 2.5 and in Tables D-1.1 through 1.8.

The statistical determination of PCOCs through comparisons of background and site data were complicated by the presence of nondetects at multiple detection limits. The branching flowchart for selecting appropriate statistical methodology was presented in the Statistical Applications report SA-93-010 for OU 2 and is contained on the following page. In this flowchart, two cases use non-statistical criteria for PCOC determinations. In the first case, for volatile organic analytes/semi-volatile organic analytes (VOAs/SVOAs), no background levels are expected; therefore, no background comparison is made. Instead, an administrative convention is used which labels analytes PCOCs if a standard is exceeded or if five percent or more detects are present. In the second case, if fewer than ten percent detects have been observed for both site and background data, statistical comparisons are not practical; therefore, PCOC determination is based only on the exceedance of a standard. In this latter case, the designation is referred to as a "potential COC."

For the remaining cases identified in the chart, statistical comparisons of site and background data are made. For large numbers of non-detects, a nonparametric scores approach was recommended in the OU 2 report. This scores approach reduces to the common Mann-Whitney/Wilcoxon nonparametric rank test for comparing two groups of data when no nondetects are present. It was shown in the OU 2 report that essentially identical PCOC determinations result if the scores test approach is used, even for the cases of no or minimal numbers of nondetects. For this reason, the scores approach was used in this report for all statistical comparisons, primarily to avoid the questionable practice of nondetect replacement and the tedious analysis sequence including sample size considerations, goodness-of-fit testing, data transformations, and variance testing for the many analytes involved. Again, it is emphasized that using the scores approach universally rather than branching to a t-test or Mann-Whitney/Wilcoxon test in the flowchart will only very rarely generate a different PCOC conclusion, and in such cases anomalous data such as outliers are likely the cause of

Environmental COC Determination Statistical Analysis Flow Chart



The p-values below 0.05 in Tables D-1.1 through D-1.8 indicate that site values are elevated relative to background or literature comparison values, and the result is a PCOC determination. The statistical source of these p-values is the scores test described above. The 0.05 level for the p-value is the Type I error probability of obtaining a sample which leads to a PCOC determination when in fact the underlying site analyte levels are not elevated relative to background.

Determination of Mean Values in Summary Statistics

Means for background and site data were calculated to facilitate risk assessment. However, it is crucial to note that means are fairly volatile estimates of the data set in the presence of nondetects and outliers, occurrences which are common in environmental data. It could even be the case that a PCOC determination would be made by the nonparametric ranking methods when the background mean was greater than the site mean. This would occur if extreme outliers were present in the background while the bulk of the site data was in fact elevated relative to the bulk of the background data. Means are highly affected by such outlying values.

In addition, it is essential to note that the mean, median, 85th percentile, and interquartile range values displayed in Tables 1-5 require special treatment for the non-detect values at varying detection limits. For small numbers of non-detects (less than 20 percent), the statistical measures computed should be relatively insensitive to the handling of non-detects. For larger numbers of non-detects, no good method of handling the many non-detects at multiple detection limits exists. The shortcomings of using such statistical measures in these cases should be realized.

The convention for handling the non-detect values when calculating mean values was uniform replacement. For example, if four non-detects were observed at the detection limit value of 10.0, they were replaced by the values 2.0, 4.0, 6.0, and 8.0. Note that in many cases this could result in the maximum reported value for an analyte actually being a replacement value for a non-detect. Since this is a poor alternative, any non-detects that were more than twice the maximum detected value for all pond locations were omitted from the summary statistics computation.

Other Information Not Included in This Text

Not all statistical information generated in support of the risk assessment is included in this appendix due to volume considerations; however the tables included in Section 2.5 and this appendix should provide adequate information for most purposes. Information generated but not included in this appendix follows:

1) Box and whisker plots used in PCOC determinations;

2) Various tables and graphs involving summary statistics for the ponds including minimum detect and nondetect values;

3) Statistical tables and graphs involving distribution tests for normal and lognormal distributions; and

4) Printout of the data set.

TABLES D-1.1 THROUGH D-1.8
HUMAN HEALTH RISK ASSESSMENT COCs

Table L

(page 1of 2)

HUMAN HEALTH RISK ASSESSME. OC's: Site 1 - Ponds A1 and A2

Contaminant	SITE						BACKGROUND						SCORES	POTENTIAL	ESSENTIAL	LITERATURE VALUE			HUMAN	COMMENTS
	SAMPLE MEAN	LOGNORMAL 95% UCL FOR MEAN	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT NONDETECT	SAMPLE MEAN	LOGNORMAL 95% UTL	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT NONDETECT	TEST P-VALUE	COC	NUTRIENT	MIN (1)	MEAN (2)	MAX (1)	HEALTH COC	
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM-241	0.018	0.034	0.064		9		0.004	0.023	0.024		82		0.0016	YES					**YES**	max>UTL ,sig p value, site=3*BG
CESIUM-137	0.108	0.247	0.58		12		0.096	1.158	1.7		76		0.4496	NO						
PLUTONIUM-239/240	0.022	0.028	0.042		14		0.004	0.017	0.04		83		0.0001	YES					**YES**	max>UTL ,sig p value, site=4*BG
STRONTIUM-89,90	0.589	0.75	0.8919		12		0.546	1.893	1.8		57		0.2405	NO						
TRITIUM	55.75	173.774	130		4		51.452	1403.865	550		53		0.5435	NO						
URANIUM 233,234	3.346	3.872	4.952		14		0.458	1.364	2.59		60		0.0001	YES					**YES**	max>UTL ,sig p value, site=7*BG
URANIUM-235	0.203	0.313	0.35		14		0.04	0.193	0.2		56		0.0001	YES					**YES**	max>UTL ,sig p value, site=4*BG
URANIUM-238	4.917	5.765	6.929		14		0.36	1.3	1.82		54		0.0001	YES					**YES**	max>UTL ,sig p value, site=10*BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	209.635	499.4	1500	8	13	38.5	695.294	4404.622	5840	79	110	28.2	0.9556	NO				500		
ANTIMONY	9.392	14.935	N/A	0	13	100	14.23	55.28	26.5	9	91	90.1	N/A	NO				1		
ARSENIC	3.915	10.555	7.8	10	13	23.1	1.781	8.183	2.9	10	84	88.1	0.0001	YES		1		10	**NO**	sig p value,site= within BG liter. rang
BARIUM	50.477	63.678	76	13	13	0	67.617	148.877	306	84	103	18.4	0.9168	NO		9		152		
BERYLLIUM	0.369	0.62	N/A	0	13	100	0.943	4.756	8.4	6	87	93.1	N/A	NO		1		130		no detects
CADMIUM	1.462	2.091	N/A	0	8	100	1.744	6.426	N/A	0	80	100	N/A	NO						no detects
CALCIUM	27984.615	35650	46800	13	13	0	24924.572	96761.525	74600	125	125	0	0.1262	NO	YES					
CESIUM	153.462	660.581	120	1	13	92.3	247.467	1551.727	400	8	92	91.3	N/A	NO			0.02			
CHROMIUM	1.538	2.413	N/A	0	13	100	4.234	16.863	18.9	15	91	83.5	0.9576	NO		0.73	10	84		no detects
COBALT	1.512	2.527	N/A	0	13	100	2.398	9.256	7.9	6	88	93.2	N/A	NO			0.2	5.8		no detects
COPPER	2.068	3.127	3.7	1	11	90.9	6.198	28.468	15.5	34	93	63.4	0.9974	NO		0.83	10	105		
IRON	211.185	387.305	1100	7	13	46.2	1335.636	6637.829	26300	118.9	129	7.8	0.9994	NO	YES					
LEAD	2.023	4.62	11	4	13	69.2	2.044	8.567	21	37	104	64.4	0.6032	YES		0.1 (4)		30 (4)	**NO**	max slightly>UTL,insig p value
LITHIUM	44.777	48.778	56.2	13	13	0	13.711	63.036	11.6	47	98	52	0.0001	YES		0.075	1.1	37	**YES**	sig p value, site = 4*BG
MAGNESIUM	30046.154	33207.1	35500	13	13	0	5279.619	11266.249	16600	106	118	10.2	0.0001	YES	YES				**NO**	essential nutrient
MANGANESE	128.177	470.601	684	13	13	0	99.317	488.154	4060	112.1	123	8.9	0.1837	YES				1000	**NO**	max>UTL,insig p value
MERCURY	0.12	0.239	0.36	1	13	92.3	0.14	0.638	1.4	8	94	91.5	N/A	NO		0.01		10		
MOLYBDENUM	2.912	4.453	5.8	2	13	84.6	5.279	23.37	25.1	12	97	87.6	0.6833	NO				6.9		
NICKEL	5.969	10.139	23.7	6	13	53.8	7.384	33.254	12.1	14	92	84.8	0.0142	YES			10	71	**NO**	sig p value,only 1/13 elevated
POTASSIUM	7693.077	8565.485	10000	13	13	0	1775.375	5432.96	6700	68	100	32	0.0001	YES	YES				**NO**	essential nutrient
SELENIUM	1.4	2.334	1.8	2	13	84.6	1.378	5.462	2	4	92	95.7	0.0326	YES		0.1	0.2	400	**NO**	slightly sig p, max & mean = BG
SILICON	1075.893	3380.199	2680	11	14	21.4	5861.897	19227.637	11700	39	39	0	1	NO						
SILVER	1.946	3.305	N/A	0	13	100	2.856	11.482	7.9	12	88	86.4	0.9195	NO		0.09 (3)		0.55 (3)		no detects
SODIUM	171384	185825.463	213000	13	13	0	17166.929	38052.976	45400	126	127	0.8	0.0001	YES	YES				**NO**	essential nutrient
STRONTIUM	339.615	394.417	486	13	13	0	195.594	472.439	408	89	106	16	0.0001	YES		6.3		802	**YES**	max>UTL ,sig p value, site=2*BG
THALLIUM	1.545	2.728	2.1	1	13	92.3	1.043	3.866	3.4	3	96	96.9	N/A	NO						
TIN	7.746	11.367	N/A	0	12	100	22.609	92.862	180	17	90	81.1	0.989	NO						no detects
VANADIUM	3.369	5.608	7.1	7	13	46.2	7.836	42.095	18.2	27	92	70.7	0.2974	NO						
ZINC	5.7	14.143	26	3	13	76.9	38.291	182.699	480	87.9	123	28.5	0.9997	NO		5	10	45		
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	0.006	0.011		0	14	100	0.006	0.031	0.0404	3	106	97.2	N/A	NO						no detects
NITRATE	N/A	N/A	N/A	N/A	N/A	N/A	0.15	N/A	0.25	1	2	50	N/A	N/A				83		no sample data
NITRATE/NITRITE	0.013	0.212	0.37	6	14	57.1	0.389	3.111	4.3	72	125	42.4	0.9397	NO						
NITRITE	0.011	0.022	0.03	1	14	92.9	0.012	0.054	0.058	3	75	96	N/A	NO						max<UTL, no p value, site= BG

Table D — HUMAN HEALTH RISK ASSESSME… OC's: Site 1 - Ponds A1 and A2

(page 2 of 2)

		SITE					BACKGROUND						SCORES						HUMAN	COMMENTS
Contaminant	CWQCC STANDARD	SAMPLE MEAN	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT DETECT	SAMPLE MEAN	LOGNORMAL 95% UTL	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT DETECT	TEST P-VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HEALTH COC	
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
ACETONE	N/A	6.55	15	1	10	10								0	NO					1/10 detects
BIS(2-ETHYLHEXYL)PHTHALATE	1.8	22.875	220	1	12	8.33		27.528	N/A	0	16	0	N/A	1	YES				NO	1 exc.,1/10 detects, pot. lab contan
1,2,3 TRICHLOROBENZENE	N/A	0.0555	0.11	1	11	9.09								0	NO					1/11 detects
1,2,4 TRICHLOROBENZENE	N/A	0.0558	0.12	1	12	8.33								0	NO					1/12 detects
BENZENE, 1,2,4-TRIMETHYL	N/A	0.0564	0.12	1	11	9.09								0	NO					1/11 detects
HEXACHLOROBUTADIENE	0.45	0.07	0.29	1	12	8.33								0	NO					1/12detects
NAPHTHALENE	0.0028	0.1483	0.68	1	12	8.33								1	YES				NO	1 exc., 1/10detects
TETRACHLOROETHENE	0.8	0.0792	0.68	2	12	16.67								0	YES				YES	2/12 detects
TRICHLOROETHENE	66	0.0817	0.54	2	12	16.67								0	YES				YES	2/12 detects
CIS-1,3-DICHLOROPROPENE	10	0.08	0.41	1	12	8.33								0	NO					1/12 detects
N-BUTYLBENZENE	N/A	0.1491	0.64	1	11	9.09								0	NO					1/11 detects
ATRAZINE	3	1.0458	3	10	12	83.33								0	YES				YES	10/12 detects

NOTES:

1. Foust, Samuel. 1981. "Chemistry of Natural Waters". Ann Arbor Science.
2. Hem, John. USGS. 1989. "Study and Interpretation of the Chemical Characteristics of Natural Water" Water Supply Paper 2254.
3. EPA. 1979. "Water-related Environmental Fate of 129 Priority Pollutants. Volume I: Introduction and Technical Background, Metals and Inorganics, Pesticides and PCBs". NTIS/PB80-204373.
4. Fergussen, Jack E. 1989. "The Heavy Elements: Chemistry, Environmental and Health Effects".

Table D

(page 1of 2)

HUMAN HEALTH RISK ASSESSMEN C's: Site 2 - Ponds A3 and A4

Contaminant	SITE						BACKGROUND						SCORES	POTENTIAL	ESSENTIAL	LITERATURE VALUE			HUMAN	COMMENTS
	SAMPLE MEAN	LOGNORMAL 95% UCL FOR MEAN	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT NONDETECT	SAMPLE MEAN	LOGNORMAL 95% UTL	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT NONDETECT	TEST P-VALUE	COC	NUTRIENT	MIN	MEAN	MAX	HEALTH COC	
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM-241	0.004	0.006	0.03		48		0.004	0.023	0.024		82		0.4836	YES					**NO**	insig p value
CESIUM-137	0.068	0.114	1.4		49		0.096	1.158	1.7		76		0.7959	YES					**NO**	insig p value
PLUTONIUM-239/240	0.005	0.006	0.025		55		0.004	0.017	0.04		83		0.2312	YES					**NO**	insig p value
STRONTIUM-89,90	0.353	0.405	0.99		46		0.546	1.893	1.8		57		0.9806	NO						
TRITIUM	121.293	183.45	1000		22		51.452	1403.865	550		53		0.2299	NO						
URANIUM-233,234	1.378	1.613	4.58		60		0.458	1.364	2.59		60		0.0001	YES					**YES**	sig p value, site=3*BG
URANIUM-235	0.084	0.104	0.284		60		0.04	0.193	0.2		56		0.0001	YES					**YES**	sig p value, site=2*BG
URANIUM-238	1.542	1.83	4.6		59		0.36	1.3	1.82		54		0.0001	YES					**YES**	sig p value, site=3*BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	320.029	1563	1100	15	21	28.6	695.294	4404.622	5840	79	110	28.2	0.6988	NO				500		
ANTIMONY	12.648	18.39	N/A	0	21	100	14.23	55.28	26.5	9	91	90.1	N/A	NO				1		no detects
ARSENIC	1.276	1.917	2	3	21	85.7	1.781	8.183	2.9	10	84	88.1	0.3669	NO		1		10		
BARIUM	84.324	88.61	104	20	21	4.8	67.617	148.877	306	84	103	18.4	0.0001	YES		9		152	**YES**	sig p value, site=1.2*BG
BERYLLIUM	0.626	1.004	1.9	1	21	95.2	0.943	4.756	8.4	6	87	93.1	N/A	NO		1		130		
CADMIUM	1.589	2.134	N/A	0	18	100	1.744	6.426	N/A	0	80	100	N/A	NO						no detects
CALCIUM	45395	47979.5	56700	21	21	0	24924.572	96761.525	74600	125	125	0	0.0001	YES	YES				**NO**	essential nutrient
CESIUM	218.8	1378	1100	5	20	75	247.467	1551.727	400	8	92	91.3	0.014	YES			0.02		**NO**	sig p value,1 elevated of 5 /20 detects
CHROMIUM	2.269	3.321	2	1	21	95.2	4.234	16.863	18.9	15	91	83.5	0.9747	NO		0.73	10	84		
COBALT	2.258	3.505	N/A	0	21	100	2.398	9.256	7.9	6	88	93.2	N/A	NO			0.2	5.8		no detects
COPPER	5.045	9.955	17.2	6	20	70	6.198	28.468	15.5	34	93	63.4	0.7333	NO		0.83	10	105		
IRON	237.5	1204	800	16	21	23.8	1335.636	6637.829	26300	118.9	129	7.8	0.9999	NO	YES					
LEAD	2.455	5.385	19.1	8	20	60	2.044	8.567	21	37	104	64.4	0.3474	YES		0.1		30	**NO**	insig p value, site max & mean=BG
LITHIUM	13.62	19.601	15.8	11	17	35.3	13.711	63.036	11.6	47	98	52	0.0001	YES		0.075	1.1	37	**NO**	sig p value, site mean & max = BG
MAGNESIUM	11530	12397	15000	21	21	0	5279.619	11266.249	16600	106	118	10.2	0.0001	YES	YES					essential nutrient
MANGANESE	53.21	113.3	150	21	22	4.5	99.317	488.154	4060	112.1	123	8.9	0.26	NO				1000		
MERCURY	0.096	0.153	N/A	0	24	100	0.14	0.638	1.4	8	94	91.5	N/A	NO		0.01		10		no detects
MOLYBDENUM	6.597	13.27	8.2	3	17	82.4	5.279	23.37	25.1	12	97	87.6	0.3752	NO				6.9		
NICKEL	7.236	11.161	6.5	5	21	76.2	7.384	33.254	12.1	14	92	84.8	0.2034	NO			10	71		
POTASSIUM	5435	6571	10100	20	21	4.8	1775.375	5432.96	6700	68	100	32	0.0001	YES	YES					essential nutrient
SELENIUM	1.602	2.445	3.4	5	21	76.2	1.378	5.462	2	4	92	95.7	0.0001	YES		0.1	0.2	80	**NO**	sig p value, 1 elevated of 5/21 detects
SILICON	2891	3377.286	3550	9	9	0	5861.897	19227.637	11700	39	39	0	0.9984	NO						
SILVER	1.96	2.787	N/A	0	21	100	2.856	11.482	7.9	12	88	86.4	0.9714	NO		0.09		0.55		no detects
SODIUM	38071	42187	52200	21	21	0	17166.929	38052.976	45400	126	127	0.8	0.0001	YES	YES				**NO**	essential nutrient
STRONTIUM	301.7	330.2	360	17	18	5.6	195.594	472.439	408	89	106	16	0.0001	YES		6.3		802		
THALLIUM	1.006	1.715	N/A	0	21	100	1.043	3.866	3.4	3	96	96.9	N/A	NO						no detects
TIN	13.65	22.73	23.1	1	16	93.8	22.609	92.862	180	17	90	81.1	0.9289	NO						
VANADIUM	3.717	5.138	6.1	7	21	66.7	7.836	42.095	18.2	27	92	70.7	0.7535	NO						
ZINC	20.33	34.401	105	14	21	33.3	38.291	182.699	480	87.9	123	28.5	0.7955	NO		5	10	45		
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	2.873	N/A	0.6	1	13	92.3	0.006	0.031	0.0404	3	106	97.2	N/A	YES					**NO**	only 1/13 detects
NITRATE	110.7	N/A	430	4	4	0	0.15	N/A	0.25	1	2	50	0.032	YES				83	**NO**	sig p value, only 1 elevated of 4/4 detec
NITRATE/NITRITE	2.942	3.724	8.2	106	107	0.9	0.389	3.111	4.3	72	125	42.4	0.0001	YES					**YES**	sig p value, site=10*BG
NITRITE	0.125	0.196	1.4	51	55	7.3	0.012	0.054	0.058	3	75	96	0.0001	YES					**YES**	sig p value, site=10*BG

Table D

(page 2 of 2)

HUMAN HEALTH RISK ASSESSMEN. C's: Site 2 - Ponds A3 and A4

		SITE					BACKGROUND						SCORES						HUMAN	COMMENTS
Contaminant	CWQCC STANDARD	SAMPLE MEAN	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT DETECT	SAMPLE MEAN	LOGNORMAL 95% UTL	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT DETECT	TEST P-VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HEALTH COC	
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
1,1- DICHLOROETHENE	0.057	2.6098	17	1	132	0.76								1	YES				**NO**	only 1/32 detects
METHYLENE CHLORIDE	4.7	2.9621	8	9	132	6.82	4.794	17.262	31	14	89	15.7	0.9944	9	YES				**NO**	insig p. potential lab cont.
TETRACHLOROETHENE	0.8	2.621	14	2	132	1.52								2	YES				**NO**	only 2/132 detects
BIS(2-ETHYLHEXYL)PHTHALATE	1.8	5.409	19	2	33	6.06	N/A	27.528	N/A	0	16	0	N/A	2	YES				**NO**	not RF waste-related
1,1,1- TRICHLOROETHANE	200	0.0888	42	1	16	6.25								0	NO					
1,1- DICHLORETHENE	0.057	0.1381	17	1	16	6.25								1	YES				**NO**	only 1/16 detects
TETRACHLOROETHENE	0.8	0.08	N/A	1	16	6.25								0	NO					
DICAMBA	N/A	0.475	2.1	7	12	58.33								N/A	YES				**YES**	7/12 detects
DICHLOROPROP	N/A	0.475	1.8	1	12	8.33								N/A	YES				**NO**	only 1/12 detects
ATRAZINE	3	0.7281	4.6	45	76	59.21								5	YES				**YES**	45/76 detects
SIMAZINE	4	0.1563	0.97	8	64	12.5								0	YES				**YES**	8/64 detects

Table D

(page 1of 2)

HUMAN HEALTH RISK ASSESSMENT (;: Site 3 - Ponds B1 and B2

Contaminant	SITE						BACKGROUND						SCORES	POTENTIAL	ESSENTIAL	LITERATURE VALUE			HUMAN	COMMENTS
	SAMPLE MEAN	LOGNORMAL 95% UCL FOR MEAN	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT NONDETECT	SAMPLE MEAN	LOGNORMAL 95% UTL	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT NONDETECT	TEST P-VALUE	COC	NUTRIENT	MIN	MEAN	MAX	HEALTH COC	
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM-241	0.021	0.038	0.054		9		0.004	0.023	0.024		82		0.0002	YES					YES	
CESIUM-137	0.371	0.717	2.9		12		0.096	1.158	1.7		76		0.1085	YES					NO	only 1/12 elevated
PLUTONIUM-239/240	0.05	0.079	0.16		14		0.004	0.017	0.04		83		0.0001	YES					YES	
STRONTIUM-89,90	0.179	0.268	0.56		12		0.546	1.893	1.8		57		0.9996	NO						
TRITIUM	249.5	506.453	650		6		51.452	1403.865	550		53		0.0283	YES					NO	only 1/6 elevated
URANIUM-233,234	1.37	1.76	2.4		14		0.458	1.364	2.59		60		0.0001	YES					YES	sig p value, site=2*BG
URANIUM-235	0.092	0.125	0.14		14		0.04	0.193	0.2		56		0.0003	YES					YES	sig p value, site=2*BG
URANIUM-238	1.254	1.481	1.9		14		0.36	1.3	1.82		54		0.0001	YES					YES	sig p value, site=3*BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	152.6	374.6	520	6	12	50	695.294	4404.622	5840	79	110	28.2	0.9388	NO				500		
ANTIMONY	10.98	17.81	N/A	0	12	100	14.23	55.26	26.5	9	91	90.1	N/A	NO				1		no detects
ARSENIC	2.144	4.813	4.1	5	9	44.4	1.781	8.183	2.9	10	84	88.1	0.0001	YES		1		10	NO	sig p value, site mean in lower range of lit. BG
BARIUM	40.82	240.13	121	8	12	33.3	67.617	148.877	306	84	103	18.4	0.9591	NO		9		152		
BERYLLIUM	0.379	0.756	1.6	1	12	91.7	0.943	4.756	8.4	6	87	93.1	N/A	NO		1		130		
CADMIUM	1.58	2.251	N/A	0	10	100	1.744	6.426	N/A	0	80	100	N/A	NO						no detects
CALCIUM	21900	26788	47400	12	12	0	24924.572	96761.525	74600	125	125	0	0.9233	NO	YES					essential nutrient
CESIUM	233.3	821.5	N/A	0	12	100	247.467	1551.727	400	8	92	91.3	N/A	NO			0.02			no detects
CHROMIUM	1.955	3.028	N/A	0	11	100	4.234	16.863	18.9	15	91	83.5	0.9383	NO		0.73	10	84		no detects
COBALT	1.838	2.836	N/A	0	12	100	2.398	9.256	7.9	6	88	93.2	N/A	NO			0.2	5.8		no detects
COPPER	1.888	2.702	N/A	0	12	100	6.198	28.468	15.5	34	93	63.4	0.999	NO		0.83	10	105		no detects
IRON	271.8	452.6	491	8	12	33.3	1335.636	6637.829	26300	118.9	129	7.8	0.9883	NO	YES					essential nutrient
LEAD	2.171	6.163	11	6	12	50	2.044	8.567	21	37	104	64.4	0.5038	YES		0.1		30	NO	max>UTL, insig p value, mean=BG
LITHIUM	19.32	25.25	23.6	10	12	16.7	13.711	63.036	11.6	47	98	52	0.0001	YES		0.075	1.1	37	YES	sig p value, site=1.5*BG
MAGNESIUM	20142	23293	25600	12	12	0	5279.619	11266.249	16600	106	118	10.2	0.0001	YES	YES				NO	essential nutrient
MANGANESE	74.53	114	157	12	12	0	99.317	488.154	4060	112.1	123	8.9	0.0164	YES				1000	NO	sig p value, max<UTL, mean<BG
MERCURY	0.1	0.191	N/A	0	12	100	0.14	0.638	1.4	8	94	91.5	N/A	NO		0.01		10		no detects
MOLYBDENUM	3.009	4.802	N/A	0	12	100	5.279	23.37	25.1	12	97	87.6	0.8895	NO				6.9		no detects
NICKEL	4.95	8.855	16.3	1	12	91.7	7.384	33.254	12.1	14	92	84.8	0.5	NO			10	71		
POTASSIUM	5366.7	6170	8140	12	12	0	1775.375	5432.96	6700	68	100	32	0.0001	YES	YES					essential nutrient
SELENIUM	0.895	1.481	N/A	0	11	100	1.378	5.462	2	4	92	95.7	N/A	NO		0.1	0.2	80		no detects
SILICON	1101	3756	3580	10	14	28.6	5861.897	19227.637	11700	39	39	0	1	NO						
SILVER	6.667	14.29	56.9	1	12	91.7	2.856	11.482	7.9	12	88	86.4	0.4396	YES		0.09		0.55	NO	max>UTL, insig p value, only 1/12 detect
SODIUM	62433	69057	81200	12	12	0	17166.929	38052.976	45400	126	127	0.8	0.0001	YES	YES					essential nutrient
STRONTIUM	273	308.8	301	11	12	8.3	195.594	472.439	408	89	106	16	0.0001	YES		6.3		802	YES	sig p value, max>UTL, site=1.5*BG
THALLIUM	0.827	1.158	N/A	0	12	100	1.043	3.866	3.4	3	96	96.9	N/A	NO						no detects
TIN	12.7	26.51	N/A	0	11	100	22.609	92.862	180	17	90	81.1	0.9728	NO						no detects
VANADIUM	2.308	3.53	2.9	1	12	91.7	7.836	42.095	18.2	27	92	70.7	0.9732	NO						
ZINC	6.658	24.09	24.8	2	12	83.3	38.291	182.699	480	87.9	123	28.5	0.999	NO		5	10	45		
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	0.008	0.013	N/A	0	14	100	0.006	0.031	0.0404	3	106	97.2	N/A	NO						
NITRATE	N/A	N/A	N/A	N/A	0	N/A	0.15	N/A	0.25	1	2	50	N/A	N/A				83		
NITRATE/NITRITE	0.077	0.167	0.28	2	14	85.7	0.389	3.111	4.3	72	125	42.4	0.9964	NO						
NITRITE	0.016	0.035	0.084	2	14	85.7	0.012	0.054	0.058	3	75	96	0.0488	NO						

Table D

(page 2 of 2)

HUMAN HEALTH RISK ASSESSMENT (s: Site 3 - Ponds B1 and B2

Contaminant	CWQCC STANDARD	SITE SAMPLE MEAN	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT DETECT	BACKGROUND SAMPLE MEAN	LOGNORMAL 95% UTL	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT DETECT	SCORES TEST P-VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
1,2 DICHLOROETHENE	N/A	2.906	6	1	16	6.25								0	NO					
ACETONE	N/A	37.038	240	4	13	30.77								0	YES				**YES**	4/13 detects
METHYL CHLORIDE	4.7	4.875	11	2	16	12.5	4.794	17.262	31	14	89	15.7	0.994	2	YES				**NO**	2 exceedances, insig p value, site=BG (pot. lab conta
TRICHLOROETHENE	66	4.375	11	5	16	31.25								0	YES				**YES**	5/16 detects
cis - 1,2 - DICHLOROETHENE	70	3.3		1	1	100								0	NO				**YES**	only 1/1 detects
1,2,4 - TRICHLOROBENZENE	N/A	0.0567	0.13	1	12	8.33								0	NO					
CARBON TETRACHLORIDE	18	0.3083	1.5	2	12	16.67								0	YES				**YES**	2/12 detects
CHLOROFORM	6	0.2158	0.72	7	12	58.33								0	YES				**YES**	7/12 detects
NAPHTHALENE	0.0028	0.12	0.34	1	12	8.33								1	YES				**NO**	1/12 detects
TETRACHLOROETHENE	0.8	0.2133	0.87	7	12	58.33								1	YES				**YES**	7/12 detects
TOLUENE	1000	0.133	0.5	1	12	8.33								0	NO					
TRICHLOROETHENE	66	3.0775	13	6	12	50								0	YES				**YES**	6/12 detects
VINYL CHLORIDE	2	0.1783	0.94	2	12	16.67								0	YES				**YES**	2/12 detects
cis - 1,2 - DICHLOROETHENE	70	0.75	3.4	4	11	36.36								0	YES				**YES**	4/7 detects
ATRAZINE	3	0.3033	0.85	1	12	8.33								0	NO				**NO**	1/12 detects

Table . .4 HUMAN HEALTH RISK ASSESSMŁ ƆC's: Site 4 - Pond B3

(page 1of 2)

Contaminant	SITE						BACKGROUND						SCORES	POTENTIAL	ESSENTIAL	LITERATURE VALUE			HUMAN	COMMENTS
	SAMPLE MEAN	LOGNORMAL 95% UCL FOR MEAN	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT NONDETECT	SAMPLE MEAN	LOGNORMAL 95% UTL	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT NONDETECT	TEST P-VALUE	COC	NUTRIENT	MIN	MEAN	MAX	HEALTH COC	
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM-241	0.027	0.07	0.062		5		0.004	0.023	0.024		82		0.0008	YES					**YES**	sig p value
CESIUM-137	0.211	1.141	1.15		5		0.096	1.158	1.7		76		0.5624	NO						
PLUTONIUM-239/240	0.018	0.038	0.04		5		0.004	0.017	0.04		83		0.001	YES					**YES**	sig p value, site=4*BG
STRONTIUM-89,90	0.15	0.319	0.31		5		0.546	1.893	1.8		57		0.9916	NO						
TRITIUM	51.5	1166.87	160		2		51.452	1403.865	550		53		0.4731	NO						
URANIUM 233,234	0.279	0.8	0.93		6		0.458	1.364	2.59		60		0.8904	NO						
URANIUM-235	0.027	0.07	0.064		6		0.04	0.193	0.2		56		0.5506	NO						
URANIUM-238	0.288	0.607	0.93		6		0.36	1.3	1.82		54		0.5	NO						
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	526.6	2364	1000	5	5	0	695.294	4404.622	5840	79	110	28.2	0.1119	NO				500		
ANTIMONY	11.84	31.13	N/A	0	5	100	14.23	55.28	26.5	9	91	90.1	N/A	NO				1		
ARSENIC	0.975	13.19	A/A	0	4	100	1.781	8.183	2.9	10	84	88.1	0.7568	NO		1		10		no detects
BARIUM	16.49	54.93	30	4	5	20	67.617	148.877	306	84	103	18.4	1	NO		9		152		
BERYLLIUM	0.37	0.725	N/A	0	5	100	0.943	4.756	8.4	6	87	93.1	N/A	NO		1		130		no detects
CADMIUM	1.867	9.33	N/A	0	3	100	1.744	6.426	N/A	0	80	100	N/A	NO						no detects
CALCIUM	33940	40134	40000	5	5	0	24924.572	96761.525	74600	125	125	0	0.0057	YES	YES				**NO**	essential nutrient
CESIUM	165	4196	50	1	5	80	247.467	1551.727	400	8	92	91.3	0.543	NO			0.02			
CHROMIUM	3.17	9.352	6.4	1	5	80	4.234	16.863	18.9	15	91	83.5	0.5718	NO		0.73	10	84		
COBALT	2.07	4.748	2.1	1	5	80	2.398	9.256	7.9	6	88	93.2	0.6807	NO			0.2	5.8		
COPPER	4.713	19.944	7.3	2	4	50	6.198	28.468	15.5	34	93	63.4	0.3374	NO		0.83	10	105		
IRON	136.2	492.96	254	2	5	60	1335.636	6637.829	26300	119	129	7.8	0.991	NO	YES					essential nutrient
LEAD	3.72	8.358	6.6	5	5	0	2.044	8.567	21	37	104	64.4	0.0016	YES		0.1		30	**NO**	sig p value, 5/5 detects, site mean is within lower range of lit.
LITHIUM	8.86	173.7	19	3	5	40	13.711	63.036	11.6	47	98	52	0.0081	YES		0.075	1.1	37	**NO**	sig p value, mean<BG
MAGNESIUM	6624	7619	8100	5	5	0	5279.619	11266.249	16600	106	118	10.2	0.0105	YES	YES				**NO**	essential nutrient
MANGANESE	43.36	67.01	63	5	5	0	99.317	488.154	4060	112	123	8.9	0.2865	NO				1000		
MERCURY	0.1	0.315	N/A	0	5	100	0.14	0.638	1.4	8	94	91.5	N/A	NO		0.01		10		no detects
MOLYBDENUM	4.88	17.22	N/A	0	5	100	5.279	23.37	25.1	12	97	87.6	0.7518	NO				6.9		no detects
NICKEL	6.35	15.75	9.2	1	5	80	7.384	33.254	12.1	14	92	84.8	0.1607	NO			10	71		
POTASSIUM	13404	17824	16000	5	5	0	1775.375	5432.96	6700	68	100	32	0	YES	YES				**NO**	essential nutrient
SELENIUM	1.14	5.392	N/A	0	5	100	1.378	5.462	2	4	92	95.7	N/A	NO		0.1	0.2	80		no detects
SILICON	4413	4874	5010	6	6	0	5861.897	19227.637	11700	39	39	0	0.8074	NO						
SILVER	2.38	6.607	N/A	0	5	100	2.856	11.482	7.9	12	88	86.4	0.7349	NO		0.09		0.55		no detects
SODIUM	30300	35657	36000	5	5	0	17166.929	38052.976	45400	126	127	0.8	0.0007	YES	YES				**NO**	essential nutrient
STRONTIUM	169.6	210.23	230	5	5	0	195.594	472.439	408	89	106	16	0.0093	YES		6.3		802	**NO**	sig p value, mean<BG
THALLIUM	1.14	2.899	N/A	0	5	100	1.043	3.866	3.4	3	96	96.9	N/A	NO						no detects
TIN	10.19	22.565	N/A	0	5	100	22.609	92.862	180	17	90	81.1	0.8832	NO						no detects
VANADIUM	5.7	18.87	9.7	3	5	40	7.836	42.095	18.2	27	92	70.7	0.0371	YES					**NO**	slightly sig p value, mean<BG
ZINC	45.9	62.03	59.9	4	5	20	38.291	182.699	480	88	123	28.5	0.0302	YES		5	10	45	**NO**	slightly sig p value, max<BG, site=BG
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	0.005	0.013	N/A	0	6	100	0.006	0.031	0.0404	3	106	97.2	N/A	NO						no detects
NITRATE	N/A	N/A	N/A	0	0	0	0.15	N/A	0.25	1	2	50	N/A	N/A				83		
NITRATE/NITRITE	7.32	65.381	9.6	5	5	0	0.389	3.111	4.3	72	125	42.4	0.0001	NO						
NITRITE	0.636	1.298	1.4	4	4	0	0.012	0.054	0.058	3	75	96	0.0001	YES					**YES**	sig p value, site = 50 * BG
TOTAL																				

Table . .4 HUMAN HEALTH RISK ASSESSME ,OC's: Site 4 - Pond B3

(page 2 of 2)

		SITE					BACKGROUND						SCORES							
Contaminant	CWQCC STANDARD	SAMPLE MEAN	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT DETECT	SAMPLE MEAN	LOGNORMAL 95% UTL	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT DETECT	TEST P-VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
ACETONE	N/A	8.167	24	1	6	16.7								0	NO					
CHLOROFORM	6	3	5	1	6	16.7								0	NO					
METHYLENE CHLORIDE	4.7	3.667	8	1	6	16.7	4.794	17.262	31	14	89	15.7	0.4845	1	YES				NO	Insig p value, potential lab contam.
HEPTACHLOR	0.00021	N/A	0	1	6	16.7								0	NO					
alpha - BHC	0.0039	N/A	0	1	6	16.7								0	NO					
alpha - CHLORDANE	N/A	N/A	0	1	6	16.7								0	NO					
beta - BHC	0.014	N/A	0	1	6	16.7								0	NO					
gamma - BHC (LINDANE)	0.019	0.0219	0.16	1	6	16.7								0	NO					
gamma - CHLORDANE	N/A	0.2192	0.17	1	6	16.7								0	NO					
1,4 - DICHLOROBENZENE	75	0.092	0.14	3	5	60								0	YES				**YES**	3/5 detects
BROMODICHLOROMETHANE	0.3	0.17	0.3	2	5	40								0	YES				**YES**	2/5 detects
CHLOROFORM	6	2.9	3.4	5	5	100								0	YES				**YES**	5/5 detects
TETRACHLOROETHENE	0.8	0.04	0.06	3	5	60								0	YES				**YES**	3/5 detects
TRICHLOROETHENE	66	0.078	0.16	4	5	80								0	YES				**YES**	4/5 detects
cis - 1,2 - DICHLOROETHENE	70	0.08	0.17	1	4	25								0	NO					
PROPAZINE	N/A	0.32	1	1	5	20								0	NO					

Table L 5 HUMAN HEALTH RISK ASSESSM. COC's: Site 5 - Ponds B4 and B5

(page 1of 2)

Contaminant	SITE SAMPLE MEAN	SITE LOGNORMAL 95% UCL FOR MEAN	SITE MAX DETECT	SITE DETECTION FREQUENCY	SITE SAMPLE SIZE	SITE PERCENT NONDETECT	BACKGROUND SAMPLE MEAN	BACKGROUND LOGNORMAL 95% UTL	BACKGROUND MAX DETECT	BACKGROUND DETECTION FREQUENCY	BACKGROUND SAMPLE SIZE	BACKGROUND PERCENT NONDETECT	SCORES TEST P-VALUE	POTENTIAL COC	ESSENTIAL NUTRIENT	LITERATURE VALUE MIN	LITERATURE VALUE MEAN	LITERATURE VALUE MAX	HUMAN HEALTH COC	COMMENTS
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM-241	0.007	0.015	0.027		28		0.004	0.023	0.024		82		0.0733	YES					NO	max>UTL, insi p value, site=BG
CESIUM-137	0.097	0.177	0.79		32		0.096	1.158	1.7		76		0.5349	NO						
PLUTONIUM-239/240	0.009	0.012	0.045		36		0.004	0.017	0.04		83		0.0005	YES					YES	sig p value, site=2*BG
STRONTIUM-89,90	0.26	0.321	0.75		30		0.546	1.893	1.8		57		0.9997	NO						
TRITIUM	197.83	287.482	1200		23		51.452	1403.865	550		53		0.0165	YES					YES	sig p value, site=4*BG
URANIUM 233,234	0.906	1.079	3.86		35		0.458	1.364	2.59		60		0.0001	YES					YES	sig p value, site=2*BG
URANIUM-235	0.055	0.077	0.29		35		0.04	0.193	0.2		56		0.1394	YES					NO	max>UTL, insig p value, site=BG
URANIUM-238	0.774	0.897	2.98		35		0.36	1.3	1.82		54		0.0001	YES					YES	sig p value, site =2*BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	336.8	1136	1580	19	24	20.8	695.294	4404.622	5840	79	110	28.2	0.5283	NO				500		
ANTIMONY	12.04	16.64	N/A	0	25	100	14.23	55.28	26.5	9	91	90.1	N/A	NO				1		no detects
ARSENIC	1.362	2.155	2.7	4	24	83.3	1.781	8.183	2.9	10	84	88.1	0.1905	NO		1		10		
BARIUM	65.13	80.37	94.7	22	24	8.3	67.617	148.877	306	84	103	18.4	0.0162	YES		9		152	NO	sig p value, mean=BG
BERYLLIUM	0.564	0.881	1	1	25	96	0.943	4.756	8.4	6	87	93.1	N/A	NO		1		130		
CADMIUM	1.68	2.27	N/A	0	22	100	1.744	6.426	N/A	0	80	100	N/A	NO						no detects
CALCIUM	42540	45462	62800	25	25	0	24924.572	96761.525	74600	125	125	0	0.0001	YES	YES				NO	essential nutrient
CESIUM	200.3	477	1200	4	26	84.6	247.467	1551.727	400	8	92	91.3	0.1122	NO			0.02			
CHROMIUM	2.322	3.333	N/A	0	25	100	4.234	16.863	18.9	15	91	83.5	0.9845	NO		0.73	10	84		no detects
COBALT	2.665	3.93	4.3	2	25	92	2.398	9.256	7.9	6	88	93.2	N/A	NO			0.2	5.8		
COPPER	5.412	8.684	12.7	12	25	52	6.198	28.468	15.5	34	93	63.4	0.252	NO		0.83	10	105		
IRON	261.4	791.3	791	17	25	32	1335.636	6637.829	26300	119	129	7.8	0.9998	NO	YES				NO	essential nutrient
LEAD	2.043	3.712	6	10	23	56.5	2.044	8.567	21	37	104	64.4	0.2861	NO		0.1		30		
LITHIUM	14.36	21.91	36.9	14	22	36.4	13.711	63.036	11.6	47	98	52	0.0001	YES		0.075	1.1	37	YES	sig p value, site detects=2* BG
MAGNESIUM	9194	10096	16700	25	25	0	5279.619	11266.249	16600	106	118	10.2	0.0001	YES	YES				NO	essential nutrient
MANGANESE	89.52	537	255	22	25	12	99.317	488.154	4060	112	123	8.9	0.0088	YES				1000	NO	sig p value, site mean & max = BG
MERCURY	0.121	0.195	0.7	1	26	96.2	0.14	0.638	1.4	8	94	91.5	N/A	NO		0.01		10		
MOLYBDENUM	7.967	12.38	17	2	22	90.9	5.279	23.37	25.1	12	97	87.6	0.2219	NO				6.9		
NICKEL	5.912	9.05	8.2	2	25	92	7.384	33.254	12.1	14	92	84.8	0.7616	NO			10	71		
POTASSIUM	9146.8	10864	12100	24	25	4	1775.375	5432.96	6700	68	100	32	0.0001	YES	YES				NO	essential nutrient
SELENIUM	1.64	2.392	4.7	5	25	80	1.378	5.462	2	4	92	95.7	0.0007	YES		0.1	0.2	80	NO	sig p value, site detect= BG detec
SILICON	4122.5	4438.8	4910	8	8	0	5861.897	19227.637	11700	39	39	0	0.9467	NO						
SILVER	2.152	3.139	5.1	2	24	91.7	2.856	11.482	7.9	12	88	86.4	0.8581	NO		0.09		0.55		
SODIUM	33988	44824	61200	25	25	0	17166.929	38052.976	45400	126	127	0.8	0.0001	YES	YES				NO	essential nutrient
STRONTIUM	255	284.4	396	20	22	9.1	195.594	472.439	408	89	106	16	0.0001	YES		6.3		802	YES	sig p value, site = 1.3*BG
THALLIUM	0.961	1.623	2.3	1	25	96	1.043	3.866	3.4	3	96	96.9	N/A	NO						
TIN	12.364	16.969	11.5	1	22	95.5	22.609	92.862	180	17	90	81.1	0.9814	NO						
VANADIUM	4.376	6.318	9.2	9	25	64	7.836	42.095	18.2	27	92	70.7	0.4487	NO						
ZINC	35.324	52.871	87.7	18	25	28	38.291	182.699	480	88	123	28.5	0.006	YES		5	10	45	NO	sig p value, mean< BG
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	9.359	9799112	33.2	5	16	68.8	0.006	0.031	0.0404	3	106	97.2	0.0001	YES					YES	sig p value, site =1000*BG
NITRATE	2.767	3.642	3.2	3	3	0	0.15	N/A	0.25	1	2	50	0.0416	YES				83	YES	sig p value, site =10*BG
NITRATE/NITRITE	3.359	4.975	18.4	91	94	3.2	0.389	3.111	4.3	72	125	42.4	0.0001	YES					YES	sig p value, site =10*BG
NITRITE	0.409	0.576	2.1	64	64	0	0.012	0.054	0.058	3	75	96	0.0001	YES					YES	sig p value, site =40*BG

Table D HUMAN HEALTH RISK ASSESSM COC's: Site 5 - Ponds B4 and B5

(page 2 of 2)

Contaminant	CWQCC STANDARD	SITE SAMPLE MEAN	SITE MAX DETECT	SITE DETECTION FREQUENCY	SITE SAMPLE SIZE	SITE PERCENT DETECT	BACKGROUND SAMPLE MEAN	BACKGROUND LOGNORMAL 95% UTL	BACKGROUND MAX DETECT	BACKGROUND DETECTION FREQUENCY	BACKGROUND SAMPLE SIZE	BACKGROUND PERCENT DETECT	SCORES TEST P-VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
ACETONE	N/A	15.36	92	12	120	10								N/A	YES				**YES**	12/120 detects
METHYLENE CHLORIDE	4.7	2.797	17	7	121	5.79	4.794	17.262	31	14	89	15.7	0.9961	7	YES				**NO**	insig p value, pot. lab contaminar
TETRACHLOROETHENE	0.8	2.6	11	2	121	1.65								2	YES				**NO**	only 2/121 detects
BIS (2 - ETHYLHEXYL) PHTHALATE	1.8	6.316	20	3	31	9.68	5	6.183	N/A	0	16	0	N/A	3	YES				**YES**	3/31 detects
alpha - BHC	0.0039	0.0238	0	1	18	5.56								0	NO					lab reported 1/18 detect at 0 ug/l
alpha - CHLORDANE	N/A	0.2238	0	1	8	12.5								N/A	NO					lab reported 1/18 detect at 0 ug/
beta - BHC	0.014	0.0268	0.051	1	18	5.56								1	YES					only 1/18 detects
gamma - BHC (LINDANE)	0.019	0.0238	0	1	18	5.56								0	NO					lab reported 1/18 detect at 0 ug/l
gamma - CHLORDANE	N/A	0.2238	0	1	8	12.5								N/A	NO					lab reported 1/18 detect at 0 ug/l
CHLOROFORM	6	0.7428	2.4	18	29	62.07								0	YES				**YES**	18/24 detects
TETRACHLOROETHENE	0.8	0.1339	0.76	7	28	25								0	YES				**YES**	7/28 detects
TRICHLOROETHENE	66	0.3831	2.1	8	29	27.59								0	YES				**YES**	8/29 detects
DICAMBA	N/A	0.2195	0.48	3	22	13.64								N/A	YES				**YES**	3/22 detects
ATRAZINE	3	0.556	3.83	18	21	83.52								1	YES				**YES**	18/21 detects
SIMAZINE	4	0.1461	1.3	12	80	15								0	YES				**YES**	12/80 detects

Table ⸱ .6 — **HUMAN HEALTH RISK ASSESSMI ⸱OC's: Site 6 - Ponds C1**

(page 1of 2)

Contaminant	SITE: SAMPLE MEAN	SITE: LOGNORMAL 95% UCL FOR MEAN	SITE: MAX DETECT	SITE: DETECTION FREQUENCY	SITE: SAMPLE SIZE	SITE: PERCENT NONDETECT	BACKGROUND: SAMPLE MEAN	BACKGROUND: LOGNORMAL 95% UTL	BACKGROUND: MAX DETECT	BACKGROUND: DETECTION FREQUENCY	BACKGROUND: SAMPLE SIZE	BACKGROUND: PERCENT NONDETECT	SCORES: TEST P-VALUE	POTENTIAL COC	ESSENTIAL NUTRIENT	LITERATURE VALUE: MIN	LITERATURE VALUE: MAX	HUMAN HEALTH COC	COMMENTS
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)										
AMERICIUM-241	0.008	0.034	0.023		4		0.004	0.023	0.024		82		0.2599	NO					
CESIUM-137	0.261	1.685	0.92		5		0.096	1.158	1.7		76		0.2398	NO					
PLUTONIUM-239/240	0.006	0.011	0.014		6		0.004	0.017	0.04		83		0.0266	YES				YES	sig p value, site=1.5 BG
STRONTIUM-89,90	0.377	0.607	0.53		5		0.546	1.893	1.8		57		0.7997	NO					
TRITIUM	187.5	1948.258	330		2		51.452	1403.865	550		53		0.1842	NO					
URANIUM-233,234	0.796	1.214	1.1		6		0.458	1.364	2.59		60		0.0082	YES				YES	sig p value, site=1.8*BG
URANIUM-235	0.07	0.099	0.098		6		0.04	0.193	0.2		56		0.0341	YES				YES	sig p value, site=1.8*BG
URANIUM-238	0.599	0.909	0.88		6		0.36	1.3	1.82		54		0.014	YES				YES	sig p value, site=1.2*BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)		
ALUMINUM	531.2	1450.7	1040	5	5	0	695.294	4404.622	5840	79	110	28.2	0.0879	NO					
ANTIMONY	15.72	68.24	32.2	1	5	80	14.23	55.28	26.5	9	91	90.1	0.0131	YES				NO	sig p value, only 1/5 detects, site=BG
ARSENIC	0.96	3.644	0.9	1	5	80	1.781	8.183	2.9	10	84	88.1	0.7183	NO		1	10		
BARIUM	91.32	121.9	120	5	5	0	67.617	148.877	306	84	103	18.4	0.0009	YES				YES	sig p value, site=1.3*BG
BERYLLIUM	0.6	1.491	1.2	2	5	60	0.943	4.756	8.4	6	87	93.1	0.0866	NO					
CADMIUM	1.825	57.64	N/A	0	2	100	1.744	6.426	N/A	0	80	100	N/A	NO					no detects
CALCIUM	44420	50377	48500	5	5	0	24924.572	96761.525	74600	125	125	0	0.0006	YES	YES			NO	essential nutrient
CESIUM	165	4196	50	1	5	80	247.467	1551.727	400	8	92	91.3	0.543	NO					
CHROMIUM	1.8	3.701	N/A	0	5	100	4.234	16.863	18.9	15	91	83.5	0.8618	NO					no detects
COBALT	1.85	6.111	N/A	0	5	100	2.398	9.256	7.9	6	88	93.2	N/A	NO					no detects
COPPER	2.225	4.404	N/A	0	4	100	6.198	28.468	15.5	34	93	63.4	0.9598	NO					no detects
IRON	904.8	1343	1230	5	5	0	1335.636	6637.829	26300	119	129	7.8	0.1075	NO	YES			NO	essential nutrient
LEAD	2.96	7.931	5.4	5	5	0	2.044	8.567	21	37	104	64.4	0.0154	YES		0.1	30	NO	sig p value due to nondetect in BG with low detection l
LITHIUM	5.4	8.034	8.3	4	5	20	13.711	63.036	11.6	47	98	52	0.0546	NO					
MAGNESIUM	9036	10033	10100	5	5	0	5279.619	11266.249	16600	106	118	10.2	0.0001	YES	YES			NO	essential nutrient
MANGANESE	136.5	361.9	240	5	5	0	99.317	488.154	4060	112	123	8.9	0.0066	YES			1000	NO	sig p value, value well within literature range.
MERCURY	0.1	0.315	N/A	0	5	100	0.14	0.638	1.4	8	94	91.5	N/A	NO					no detects
MOLYBDENUM	3.59	10.526	6.6	1	5	80	5.279	23.37	25.1	12	97	87.6	0.4547	NO					
NICKEL	3.83	10.84	N/A	0	5	100	7.384	33.254	12.1	14	92	84.8	0.8526	NO					no detects
POTASSIUM	1524	3070.8	2300	3	5	40	1775.375	5432.96	6700	68	100	32	0.3959	NO	YES			NO	essential nutrient
SELENIUM	1.33	4.497	1.5	1	5	80	1.378	5.462	2	4	92	95.7	0.0403	YES				NO	only 1/5 detects, mean < BG
SILICON	6815	8229	8950	7	7	0	5861.897	19227.637	11700	39	39	0	0.1677	NO					
SILVER	2.38	6.607	N/A	0	5	100	2.856	11.482	7.9	12	88	86.4	0.7349	NO					no detects
SODIUM	22920	26428	26400	5	5	0	17166.929	38052.976	45400	126	127	0.8	0.0169	YES	YES			NO	essential nutrient
STRONTIUM	241.8	260.4	260	5	5	0	195.594	472.439	408	89	106	16	0.0001	YES				YES	sig p value, site=1.2*BG
THALLIUM	1.14	2.899	N/A	0	5	100	1.043	3.866	3.4	3	96	96.9	N/A	NO					no detects
TIN	9.25	22.67	N/A	0	5	100	22.609	92.862	180	17	90	81.1	0.916	NO					no detects
VANADIUM	2.77	7.473	3.9	1	5	80	7.836	42.095	18.2	27	92	70.7	0.7444	NO					
ZINC	2.65	6.827	N/A	0	5	100	38.291	182.699	480	88	123	28.5	0.9969	NO					no detects
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)										
CYANIDE	0.007	0.016	N/A	0	7	100	0.006	0.031	0.0404	3	106	97.2	N/A	NO					no detects
NITRATE	N/A	N/A	N/A	0	0	0	0.15	N/A	0.25	1	2	50	N/A	N/A					no sample data
NITRATE/NITRITE	0.05	0.119	N/A	0	7	100	0.389	3.111	4.3	72	125	42.4	0.9993	NO					no detects
NITRITE	0.01	0.024	N/A	0	7	100	0.012	0.054	0.058	3	75	96	N/A	NO					no detects

Table . .6 HUMAN HEALTH RISK ASSESSM. .OC's: Site 6 - Ponds C1

(page 2 of 2)

		SITE					BACKGROUND						SCORES						
Contaminant	CWQCC STANDARD	SAMPLE MEAN	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT DETECT	SAMPLE MEAN	LOGNORMAL 95% UTL	MAX DETECT	DETECTION FREQUENCY	SAMPLE SIZE	PERCENT DETECT	TEST P-VALUE	NO OF EXCEEDANCES	POTENTIAL COC			HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)										
NONE																			

Table ..7 HUMAN HEALTH RISK ASSES... IT COC's: Site 7 - Pond C2

(page 1of 2)

Contaminant	SITE SAMPLE MEAN	SITE LOGNORMAL 95% UCL FOR MEAN	SITE MAX DETECT	SITE DETECTION FREQUENCY	SITE SAMPLE SIZE	SITE PERCENT NONDETECT	BACKGROUND SAMPLE MEAN	BACKGROUND LOGNORMAL 95% UTL	BACKGROUND MAX DETECT	BACKGROUND DETECTION FREQUENCY	BACKGROUND SAMPLE SIZE	BACKGROUND PERCENT NONDETECT	SCORES TEST P-VALUE	POTENTIAL COC	ESSENTIAL NUTRIENT	LITERATURE VALUE MIN	LITERATURE VALUE MEAN	LITERATURE VALUE MAX	HUMAN HEALTH COC	COMMENTS
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM-241	0.012	0.018	0.082		19		0.004	0.023	0.024		82		0.0736	YES					**NO**	max>UTL, insig p value, mean<BG
CESIUM-137	0.094	0.172	0.51		26		0.096	1.158	1.7		76		0.4074	NO						
PLUTONIUM-239/240	0.022	0.029	0.13		32		0.004	0.017	0.04		83		0.0001	YES					**YES**	sig p value, site = 5 * BG
STRONTIUM-89,90	0.452	0.51	0.84		24		0.546	1.893	1.8		57		0.7065	NO						
TRITIUM	85.109	142.63	540		20		51.452	1403.865	550		53		0.3507	NO						
URANIUM-233,234	1.211	1.48	2.6		27		0.458	1.344	2.59		60		0.0001	YES					**YES**	sig p value, site = 3 * BG
URANIUM-235	0.128	0.185	0.62		27		0.04	0.193	0.2		56		0.0001	YES					**YES**	sig p value, site = 3 * BG
URANIUM-238	1.514	1.849	4.06		27		0.36	1.3	1.82		54		0.0001	YES					**YES**	sig p value, site = 4 * BG
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	176.7	547.5	641	17	22	22.7	695.294	4404.622	5840	79	110	28.2	0.9267	NO				500		
ANTIMONY	12.39	17.75	N/A	0	22	100	14.23	55.28	26.5	9	91	90.1	N/A	NO				1		no detects
ARSENIC	2.436	3.859	4.9	14	22	36.4	1.781	8.183	2.9	10	84	88.1	0.0001	YES		1		10	**NO**	slightly elevated, within BG literature rang
BARIUM	83.86	92.25	202	22	22	0	67.617	148.877	306	84	103	18.4	0.0001	YES		9		152	**YES**	sig p value, site = 1.2 * BG
BERYLLIUM	0.595	1.004	0.6	1	22	95.5	0.943	4.756	8.4	6	87	93.1	N/A	NO		1		130		
CADMIUM	1.702	2.451	2.9	1	21	95.2	1.744	6.426	N/A	0	80	100	N/A	NO						
CALCIUM	45259	51047	109000	22	22	0	24924.572	96761.525	74600	125	125	0	0.0001	YES	YES				**NO**	essential nutrient
CESIUM	198.4	561	1100	4	23	82.6	247.467	1551.727	400	8	92	91.3	0.0613	NO			0.02			
CHROMIUM	2.409	3.567	N/A	0	22	100	4.234	16.863	18.9	15	91	83.5	0.9765	NO		0.73	10	84		no detects
COBALT	2.788	4.291	N/A	0	22	100	2.398	9.256	7.9	6	88	93.2	N/A	NO			0.2	5.8		no detects
COPPER	4.184	7.331	11.6	6	22	72.7	6.198	28.468	15.5	34	93	63.4	0.8686	NO		0.83	10	105		
IRON	272.045	728.3	1140	18	22	18.2	1335.636	6637.829	26300	119	129	7.8	0.9993	NO	YES				**NO**	essential nutrient
LEAD	5.598	11.96	73	7	22	68.2	2.044	8.567	21	37	104	64.4	0.3823	YES		0.1		30	**NO**	only 1 detect elevated out of 7/22 detec
LITHIUM	13.56	17.85	13.6	11	18	38.9	13.711	63.036	11.6	47	98	52	0.0001	YES		0.075	1.1	37	**NO**	sig p value, mean=BG
MAGNESIUM	14304	15295	17000	22	22	0	5279.619	11266.249	16600	106	118	10.2	0.0001	YES	YES				**NO**	essential nutrient
MANGANESE	241.4	1563	1000	19	22	13.6	99.317	488.154	4060	112	123	8.9	0.0012	YES				1000	**NO**	sig p value, well below literature value
MERCURY	0.12	0.202	0.5	2	22	90.9	0.14	0.638	1.4	8	94	91.5	N/A	NO		0.01		10		
MOLYBDENUM	9.203	18.81	35	2	18	88.9	5.279	23.37	25.1	12	97	87.6	0.2641	YES				6.9	**NO**	max>UTL, insig p value
NICKEL	6.277	10.52	7	2	22	90.9	7.384	33.254	12.1	14	92	84.8	0.6925	NO			10	71		
POTASSIUM	6265	6994	11700	21	22	4.5	1775.375	5432.96	6700	68	100	32	0.0001	YES	YES				**NO**	essential nutrient
SELENIUM	1.85	2.885	10.2	4	22	81.8	1.378	5.462	2	4	92	95.7	0.0007	YES		0.1	0.2	80	**YES**	sig p value, site = 1.3 * BG
SILICON	910	N/A	910	1	1	0	5861.897	19227.637	11700	39	39	0	0.9544	NO						
SILVER	2.027	2.965	3.1	1	22	95.5	2.856	11.482	7.9	12	88	86.4	0.9314	NO		0.09		0.65		
SODIUM	48968	52875	61000	22	22	0	17166.929	38052.976	45400	126	127	0.8	0.0001	YES	YES				**NO**	essential nutrient
STRONTIUM	331.5	355.6	400	18	20	10	195.594	472.439	408	89	106	16	0.0001	YES		6.3		802	**YES**	sig p value, site = 1.7 *BG
THALLIUM	0.925	1.913	N/A	0	22	100	1.043	3.866	3.4	3	96	96.9	N/A	NO						no detects
TIN	12.15	18.38	N/A	0	18	100	22.609	92.862	180	17	90	81.1	0.9769	NO						no detects
VANADIUM	3.309	4.945	6	4	22	81.8	7.836	42.095	18.2	27	92	70.7	0.9707	NO						
ZINC	40.39	88.5	396	11	22	50	38.291	182.699	480	88	123	28.5	0.9684	YES		5	10	45	**NO**	max > UTL, insig p value
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	5.175	10.53	N/A	0	10	100	0.006	0.031	0.0404	3	106	97.2	N/A	NO						no detects
NITRATE	104.4	N/A	310	3	3	0	0.15	N/A	0.25	1	2	50	0.0416	YES				83	**YES**	sig p value, only 1/2 detects in BG
NITRATE/NITRITE	0.235	0.321	3.1	18	64	71.9	0.389	3.111	4.3	72	125	42.4	0.9993	NO						
NITRITE	0.008	0.024	0.024	3	51	94.1	0.012	0.054	0.058	3	75	96	N/A	NO						

Table .7 HUMAN HEALTH RISK ASSES. .IT COC's: Site 7 - Pond C2

(page 2 of 2)

Contaminant	CWQCC STANDARD	SITE SAMPLE MEAN	SITE MAX DETECT	SITE DETECTION FREQUENCY	SITE SAMPLE SIZE	SITE PERCENT DETECT	BACKGROUND SAMPLE MEAN	BACKGROUND LOGNORMAL 95% UTL	BACKGROUND MAX DETECT	BACKGROUND DETECTION FREQUENCY	BACKGROUND SAMPLE SIZE	BACKGROUND PERCENT DETECT	SCORES TEST P-VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
METHYLENE CHLORIDE	4.7	2.882	10	7	105	6.67	2.882	17.26	31	14	89	15.7	0.9907	7	YES				**NO**	Insig p value, pot. lab contaminant
TETRACHLOROETHENE	0.8	2.586	13	1	105	0.95								1	YES				**NO**	only 1/105 detects
BIS (2 - ETHYLHEXYL) PHTHALATE	1.8	8.304	44	4	23	17.39	8.304	11.82	N/A	0	16	0	0.0414	4	YES				**NO**	pot. lab contaminant
1,1,1 - TRICHLOROETHANE	200	0.1468	0.83	2	22	9.09								0	YES				**YES**	2/22 detects
ATRAZINE	3	0.2109	1	45	68	66.18								0	YES				**YES**	45/68 detects

Table .8 HUMAN HEALTH RISK ASSESSMEN C's: Site 8 - Landfill Pond

(page 1of 2)

Contaminant	SITE SAMPLE MEAN	SITE LOGNORMAL 95% UCL FOR MEAN	SITE MAX DETECT	SITE DETECTION FREQUENCY	SITE SAMPLE SIZE	SITE PERCENT NONDETECT	BACKGROUND SAMPLE MEAN	BACKGROUND LOGNORMAL 95% UTL	BACKGROUND MAX DETECT	BACKGROUND DETECTION FREQUENCY	BACKGROUND SAMPLE SIZE	BACKGROUND PERCENT NONDETECT	SCORES TEST P-VALUE	POTENTIAL COC	ESSENTIAL NUTRIENT	LITERATURE VALUE MIN	LITERATURE VALUE MEAN	LITERATURE VALUE MAX	HUMAN HEALTH COC	COMMENTS
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/l)				(pCi/l)	(pCi/l)	(pCi/l)											
AMERICIUM-241	0.006	0.01	0.021		13		0.004	0.023	0.024		82		0.0973	NO						
CESIUM-137	0.159	0.321	0.5		12		0.096	1.158	1.7		76		0.129	NO						
PLUTONIUM-239/240	0.006	0.008	0.013		13		0.004	0.017	0.04		83		0.0026	YES					**YES**	sig p value, site + 1.5*BG
STRONTIUM-89,90	0.93	1.202	1.71		9		0.546	1.893	1.8		57		0.0044	YES					**YES**	sig p value, site + 1.8*BG
TRITIUM	484.691	770.894	1500		8		51.452	1403.865	650		63		0.0001	YES					**YES**	sig p value, site + 9*BG
URANIUM-233,234	0.255	0.372	0.434		9		0.458	1.364	2.59		60		0.8942	NO						
URANIUM-235	0.034	0.073	0.084		9		0.04	0.193	0.2		66		0.6321	NO						
URANIUM-238	0.103	0.166	0.3		9		0.36	1.3	1.82		64		[illegible]	NO						
METALS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)							(ug/l)	(ug/l)	(ug/l)		
ALUMINUM	2615	32636	26900	13	17	23.5	695.294	4404.622	5840	79	110	28.2	0.2406	YES				500	**NO**	max>UTL insig p value, only 1 elevated of 13/17 detects
ANTIMONY	19.23	26.5	27.7	3	17	82.4	14.23	55.28	26.5	9	91	90.1	0.0034	YES				1	**NO**	sig p value due to higher detection limit in site than BG
ARSENIC	2.64	4.63	4.6	7	16	53.3	1.781	8.183	2.9	10	84	88.1	0.0001	YES		1		10	**NO**	sig p value, but site = bottom of the BG literature range.
BARIUM	637.4	737.5	1550	17	17	0	67.617	148.877	306	84	103	18.4	0.0001	YES		9		152	**YES**	sig p value, site = 9* BG
BERYLLIUM	0.791	1.534	N/A	0	17	100	0.943	4.756	8.4	6	87	93.1	.N/A	NO						no detects
CADMIUM	2.543	4.48	7.6	3	16	81.3	1.744	6.426	N/A	0	80	100	0.0001	YES		1		130	**NO**	sig p value, site has 3/16 detects, site in lower range of lit.
CALCIUM	161412	161396	212000	17	17	0	24924.572	96761.525	74600	125	125	0	0.0001	YES	YES				**NO**	essential nutrient
CESIUM	252.9	655.5	N/A	0	17	100	247.467	1551.727	400	8	92	91.3	N/A	NO			0.02			no detects
CHROMIUM	8.959	22.5	29.6	5	17	70.6	4.234	16.863	18.9	15	91	83.5	0.0274	YES		0.73	10	84	**YES**	sig p value, 3 elevated of 5/17 detects, site=2*BG
COBALT	7.419	12.65	19.1	8	16	50	2.398	9.256	7.9	6	88	93.2	0.0001	YES			0.2	5.8	**YES**	sig p value, site = 3* BG
COPPER	12.076	25.79	94.9	5	17	70.6	6.198	28.468	15.5	34	93	63.4	0.2547	YES		0.83	10	106	**NO**	max>UTL insig p value, only 1 elevated of 5/17 detects
IRON	78476	86238	155000	17	17	0	1335.636	6637.829	26300	119	129	7.8	0.0001	YES	YES				**NO**	essential nutrient
LEAD	4.159	6.328	10.4	13	17	23.5	2.044	8.567	21	37	104	64.4	0.0001	YES		0.1		30	**NO**	sig p value, but site = lower part of the BG literature range
LITHIUM	46.22	55.86	107	13	17	23.5	13.711	63.036	11.6	47	98	52	0.0001	YES		0.075	1.1	37	**YES**	sig p value, site = 2* BG
MAGNESIUM	34682	37046	49000	17	17	0	5279.619	11266.249	16600	106	118	10.2	0.0001	YES	YES				**NO**	essential nutrient
MANGANESE	1619	1735	2490	17	17	0	99.317	488.154	4060	112	123	8.9	0.0001	YES				1000	**YES**	sig p value, above literature range, site = 16 * BG
MERCURY	0.108	0.187	0.28	1	17	94.1	0.14	0.638	1.4	8	94	91.6	N/A	NO		0.01		10		no p test, only 1/17 detects, mean< BG
MOLYBDENUM	10.07	24.56	28.5	5	17	70.6	5.279	23.37	25.1	12	97	87.6	0.0005	YES				6.9	**YES**	sig p value, sit = 2 * BG
NICKEL	11.75	19.7	31	4	17	76.5	7.384	33.254	12.1	14	92	84.8	0.0012	YES			10	71	**YES**	sig p value, 2 elevated out of 4/17 detects, site = 1.5 * BG
POTASSIUM	6404.7	7454.7	11700	16	17	5.9	1775.375	5432.96	6700	68	100	32	0.0001	YES	YES				**NO**	essential nutrient
SELENIUM	2.122	4.14	7	1	17	94.1	1.378	5.462	2	4	92	95.7	N/A	YES		0.1	0.2	80	**NO**	no p value, only 1/17 detects
SILICON	10385	11494	13000	10	10	0	5861.897	19227.637	11700	39	39	0	0.0001	YES					**NO**	sig p value, site is well within the BG literature values
SILVER	5.682	9.152	16.7	5	17	70.6	2.856	11.482	7.9	12	88	86.4	0.0012	YES		0.09		0.55	**YES**	sig p value, site = 2* BG
SODIUM	71006	76550.9	110000	17	17	0	17166.929	38052.976	45400	126	127	0.8	0.0001	YES	YES				**NO**	essential nutrient
STRONTIUM	905.5	1062	1370	15	17	11.8	195.594	472.439	408	89	106	16	0.0001	YES		6.3		802	**YES**	sig p value, site = 4.5*BG
THALLIUM	0.868	1.225	N/A	0	17	100	1.043	3.866	3.4	3	96	96.9	N/A	NO						no detects
TIN	49.2	127.206	243	7	17	58.8	22.609	92.862	180	17	90	81.1	0.0001	YES					**YES**	sig p value, site = 2*BG
VANADIUM	25.02	50.854	211	10	17	41.2	7.836	42.095	18.2	27	92	70.7	0.0001	YES					**YES**	sig p value, sit = 3 * BG
ZINC	3194.6	4009	16000	17	17	0	38.291	182.699	480	88	123	28.5	0.0001	YES		5	10	45	**YES**	sig p value, site = 80 * BG
INORGANICS	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
CYANIDE	0.009	0.02	0.037	1	19	94.7	0.006	0.031	0.0404	3	106	97.2	N/A	YES					**NO**	only 1/19 detects
NITRATE	0.05	N/A	N/A	0	1	100	0.15	N/A	0.25	1	2	50	0.7602	N/A				83		no detects
NITRATE/NITRITE	0.186	0.86	0.87	8	16	50	0.389	3.111	4.3	72	125	42.4	0.832	NO						
NITRITE	0.029	0.066	0.063	6	12	50	0.012	0.054	0.058	3	75	96	0.0001	NO						

Table .8 HUMAN HEALTH RISK ASSESSMEN C's: Site 8 - Landfill Pond

(page 2 of 2)

Contaminant	CWQCC STANDARD	SITE SAMPLE MEAN	SITE MAX DETECT	SITE DETECTION FREQUENCY	SITE SAMPLE SIZE	SITE PERCENT DETECT	BACKGROUND SAMPLE MEAN	BACKGROUND LOGNORMAL 95% UTL	BACKGROUND MAX DETECT	BACKGROUND DETECTION FREQUENCY	BACKGROUND SAMPLE SIZE	BACKGROUND PERCENT DETECT	SCORES TEST P-VALUE	NO OF EXCEEDANCES	POTENTIAL COC				HUMAN HEALTH COC	COMMENTS
VOA/ SVOA/ PESTICIDES	(ug/l)	(ug/l)	(ug/l)				(ug/l)	(ug/l)	(ug/l)											
1,1 DICHLOROETHANE	N/A	6.382	10	13	17	76.47								0	YES				**YES**	13/17 detects
1,2 DICHLOROETHENE	N/A	4.353	14	6	17	35.29								0	YES				**YES**	6/17 detects
2 - BUTANONE	N/A	10.65	76	3	17	17.65								0	YES				**YES**	3/17 detects
4 - METHYL- 2 - PENTANONE	N/A	9.03	12	2	17	11.76								0	YES				**YES**	2/17 detects
ACETONE	N/A	34.91	120	5	16	31.25								0	YES				**YES**	13/17 detects
CARBON DISULFIDE	N/A	2.706	6	1	17	5.88								0	NO					
CHLOROETHANE	N/A	15.24	34	10	17	58.82								0	YES				**YES**	5/16 detects
ETHYL BENZENE	680	12.97	19	14	17	82.35								0	YES				**YES**	14/17 detects
METHYLENE CHLORIDE	4.7	15.62	190	5	17	29.41	4.794	17.262	31	14	89	15.7	0.9944	5	NO				**NO**	insig p value, potential lab contaminant
TOLUENE	1000	44.32	88	15	17	88.24								0	YES				**YES**	15/17 detects
TOTAL XYLENES	N/A	14.76	24	13	17	76.47								0	YES				**YES**	13/17 detects
VINYL ACETATE	N/A	7.588	49	1	17	5.88								0	NO					
0 - XYLENE	N/A	5.167	8	2	3	66.67								0	YES				**YES**	2/3 detects
2 - METHYLNAPTHALENE	N/A	22.333	29	3	3	100								0	YES				**YES**	3/3 detects
4 - METHYLPHENOL	N/A	11	24	1	3	33.33								0	NO					
NAPHTHALENE	0.0028	20.67	29	3	3	100								3	YES				**YES**	3/3 detects

TABLES D-2.1 THROUGH D-2.8
HUMAN HEALTH CANCER AND NONCANCER RISK

TABLE D-2.1

HUMAN HEALTH CANCER AND NONCANCER RISKS: Site 1 - Ponds A1 and A2

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
AMERICIUM-241	0.018	0.034	0.065	2.4E-10	N/A	8.6E-08	3.4%	N/A	3.6E-03	0.087
PLUTONIUM-239/240	0.022	0.028	0.054	2.3E-10		6.8E-08	2.7%		3.5E-03	0.069
URANIUM 233,234	3.346	3.872	7.426	1.6E-11		6.5E-07	25.5%		2.9E-04	0.783
URANIUM-235	0.203	0.313	0.600	1.6E-11		5.3E-08	2.1%		2.7E-04	0.058
URANIUM-238	4.917	5.765	11.056	2.8E-11		1.7E-06	66.4%		2.5E-04	1.027
					TOTAL	2.6E-06	100%		TOTAL	2.025
METALS,INORGANICS, VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg-day)	SFo (risk/(mg/kg-day))	RfDo (mg/kg-day)	(LECR)	(%)	(HQ)		
LITHIUM	44.777	48.778	1.3E-03						N/A	N/A
STRONTIUM	339.615	394.417	1.1E-02		0.6			0.018		
TETRACHLOROETHENE	0.0792	0.23	6.3E-06	5.20E-02	0.01	1.4E-07	3%	0.001		
TRICHLOROETHENE	0.0817	0.328	9.0E-06	1.10E-02		4.2E-08	1%			
ATRAZINE	1.0458	1.815	5.0E-05	2.22E-01	0.035	4.7E-06	96%	0.001		
					TOTAL	4.9E-06	100%	0.020		

TABLE D-2.2

HUMAN HEALTH CANCER AND NONCANCER RISKS: Site 2 - Ponds A3 and A4

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE PT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
URANIUM-233,234	1.378	1.613	3.093	1.6E-11		2.7E-07	32.8%	N/A	2.9E-04	0.326
URANIUM-235	0.084	0.104	0.199	1.6E-11		1.7E-08	2.1%		2.7E-04	0.019
URANIUM-238	1.542	1.83	3.510	2.8E-11		5.4E-07	65.1%		2.5E-04	0.326
					TOTAL	**8.3E-07**	**100.0%**		**TOTAL**	**0.672**
METALS,INORGANICS, VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg-day)	SFo (risk/(mg/kg-day))	RfDo (mg/kg-day)	(LECR)	(%)	(HQ)		
BARIUM	84.324	88.61	2.4E-03		7.00E-02			0.035	N/A	N/A
NITRATE/NITRITE	2.942	3.724	1.0E-04		1.60E+00			0.000		
NITRITE	0.125	0.196	5.4E-06		1.00E-01			0.000		
DICAMBA	0.475	3.5	9.6E-05		3.00E-02			0.003		
ATRAZINE	0.7281	1.525	4.2E-05	2.22E-01	3.50E-02	4.0E-06	90%	0.001		
SIMAZINE	0.1563	0.308	8.4E-06	1.20E-01	2.00E-03	4.3E-07	10%	0.004		
					TOTAL	**4.4E-06**	**100.0%**	**0.043**		

TABLE D-2.3

HUMAN HEALTH CANCER AND NONCANCER RISKS: Site 3 - Ponds B1 and B2

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
AMERICIUM-241	0.021	0.038	0.073	2.4E-10	N/A	9.6E-08	9%	N/A	3.6E-03	0.097
PLUTONIUM-239/240	0.05	0.079	0.152	2.3E-10		1.9E-07	18%		3.5E-03	0.196
URANIUM 233,234	1.37	1.76	3.375	1.6E-11		3.0E-07	28%		2.9E-04	0.356
URANIUM-235	0.092	0.125	0.240	1.6E-11		2.1E-08	2%		2.7E-04	0.023
URANIUM-238	1.254	1.481	2.840	2.8E-11		4.4E-07	42%		2.5E-04	0.264
					TOTAL	1.0E-06	100%		TOTAL	0.936
METALS,INORGANICS, VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg-day)	SFo (risk/(mg/kg-day))	RfDo (mg/kg-day)	(LECR)	(%)	(HQ)		
LITHIUM	19.32	25.25	6.9E-04						N/A	N/A
STRONTIUM	273	308.8	8.5E-03		6.00E-01			0.014		
ACETONE	37.038	156.6	4.3E-03		1.00E-02			0.429		
TRICHLOROETHENE	4.375	5.48	1.5E-04	1.10E-02	1.10E-02	7.1E-07	5%	0.014		
cis - 1,2 - DICHLOROETHENE	3.3	1.631	4.5E-05		1.00E-02			0.004		
CARBON TETRACHLORIDE	0.3083	1.103	3.0E-05	1.30E-01	7.00E-04	1.7E-06	12%	0.043		
CHLOROFORM	0.2158	0.708	1.9E-05	6.10E-03	1.00E-02	5.1E-08	0%	0.002		
TETRACHLOROETHENE	0.2133	1.857	5.1E-05	5.20E-02	1.00E-02	1.1E-06	8%	0.005		
TRICHLOROETHENE	3.0775	8.35	2.3E-04	1.10E-02	1.10E-02	1.1E-06	8%	0.021		
VINYL CHLORIDE	0.1783	0.414	1.1E-05	1.9		9.2E-06	66%			
cis - 1,2 - DICHLOROETHENE	0.75	3.4	9.3E-05		1.00E-02			0.009		
					TOTAL	1.4E-05	100%	0.542		

TABLE D-2.4

HUMAN HEALTH RISK ASSESSMENT COC's: Site 4 - Pond B3

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
AMERICIUM-241	0.027	0.070	0.134	2.4E-10		1.8E-07	65.8%	N/A	3.6E-03	0.178
PLUTONIUM-239/240	0.018	0.038	0.073	2.3E-10		9.2E-08	34.2%		3.5E-03	0.094
					TOTAL	2.7E-07	100%		TOTAL	0.272
METALS,INORGANICS, VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg-day)	SFo (risk/(mg/kg-day))	RfDo (mg/kg-day)	(LECR)	(%)	(HQ)		
NITRITE	0.636	1.298	2.489		1.00E-01			0.0004	N/A	N/A
1,4 - DICHLOROBENZENE	0.092	0.243	0.466	2.40E-02	8.00E-01	6.8E-08	7%	0.000		
BROMODICHLOROMETHANE	0.17	0.714	1.369	6.20E-02	2.00E-02	5.2E-07	52%	0.001		
CHLOROFORM	2.9	3.809	7.305	6.10E-03	1.00E-02	2.7E-07	27%	0.010		
TETRACHLOROETHENE	0.04	0.122	0.234	5.20E-02	1.00E-02	7.4E-08	8%	0.000		
TRICHLOROETHENE	0.078	0.442	0.848	1.10E-02		5.7E-08	6%			
					TOTAL	9.9E-07	100%	0.012		

TABLE D-2.5

HUMAN HEALTH CANCER AND NONCANCER RISKS: Site 5 - Ponds B4 and B5

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
PLUTONIUM-239/240	0.009	0.012	0.023	2.3E-10	N/A	2.9E-08	4.5%	N/A	3.5E-03	0.030
TRITIUM	197.830	287.482	551.335	5.4E-14		1.6E-07	25.6%		6.4E-08	0.013
URANIUM 233,234	0.906	1.079	2.069	1.6E-11		1.8E-07	28.5%		2.9E-04	0.218
URANIUM-238	0.774	0.897	1.720	2.8E-11		2.6E-07	41.4%		2.5E-04	0.160
					TOTAL	**6.4E-07**	**100%**		**TOTAL**	**0.421**
METALS,INORGANICS, VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg-day)	SFo (risk/(mg/kg-day))	RfDo (mg/kg-day)	(LECR)	(%)	(HQ)		
LITHIUM	14.36	21.91	6.0E-04							
STRONTIUM	255	284.4	7.8E-03		6.00E-01			0.013	N/A	N/A
CYANIDE	9.359	14.752	4.0E-04	2.00E-02	2.00E-02	3.5E-06	46%	0.020		
NITRATE	2.767	3.642	1.0E-04		1.60E+00			0.0001		
NITRATE/NITRITE	3.359	4.975	1.4E-04		1.60E+00			0.000		
NITRITE	0.409	0.576	1.6E-05		1.00E-01			0.0002		
ACETONE	15.36	20.3	5.6E-04		1.00E-01			0.006		
BIS (2 - ETHYLHEXYL) PHTHALATE	6.316	6.316	1.7E-04	1.40E-02	2.00E-02	1.0E-06	14%	0.009		
CHLOROFORM	0.743	1.93	5.3E-05	6.10E-03	1.00E-02	1.4E-07	2%	0.005		
TETRACHLOROETHENE	0.134	0.205	5.6E-06	5.20E-02	1.00E-02	1.3E-07	2%	0.001		
TRICHLOROETHENE	0.3831	0.823	2.3E-05	1.10E-02		1.1E-07	1%			
DICAMBA	0.2195	0.385	1.1E-05		3.00E-02			0.000		
ATRAZINE	0.556	0.857	2.3E-05	2.22E-01	3.50E-02	2.2E-06	30%	0.001		
SIMAZINE	0.1461	0.256	7.0E-06	1.20E-01	2.00E-03	3.6E-07	5%	0.004		
					TOTAL	**7.5E-06**	**100%**	**0.058**		

TABLE D-2.6

HUMAN HEALTH CANCER AND NONCANCER RISKS: Site 6 - Pond C1

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCl/l)	(pCl/l)	(pCl/day)	SFo (risk/pCl)		(LECR)	(%)	(HQ)	(mrem/pCl)	(mrem/year)
PLUTONIUM-239/240	0.006	0.011	0.021	2.3E-10	N/A	2.7E-08	5.2%	N/A	3.5E-03	0.027
URANIUM 233,234	0.796	1.214	2.328	1.6E-11		2.0E-07	39.6%		2.9E-04	0.246
URANIUM-235	0.07	0.099	0.190	1.6E-11		1.7E-08	3.2%		2.7E-04	0.018
URANIUM-238	0.599	0.909	1.743	2.8E-11		2.7E-07	52.0%		2.5E-04	0.162
					TOTAL	5.1E-07	100%		TOTAL	0.453
METALS,INORGANICS, VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg-day)	SFo (risk/(mg/kg-day))	RfDo (mg/kg-day)	(LECR)	(%)	(HQ)		
BARIUM	91.32	121.9	3.3E-03		7.00E-02			0.048	N/A	N/A
STRONTIUM	241.8	260.4	7.1E-03		6.00E-01			0.012		
					TOTAL	0.00E+00	0%	0.060		

TABLE D-2.7

HUMAN HEALTH CANCER AND NONCANCER RISKS: Site 7 - Pond C2

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
PLUTONIUM-239/240	0.022	0.029	0.056	2.3E-10	N/A	7.0E-08	7.8%	N/A	3.5E-03	0.072
URANIUM 233,234	1.211	1.48	2.838	1.6E-11		2.5E-07	27.8%		2.9E-04	0.299
URANIUM-235	0.128	0.185	0.355	1.6E-11		3.1E-08	3.5%		2.7E-04	0.034
URANIUM-238	1.514	1.849	3.546	2.8E-11		5.4E-07	60.8%		2.5E-04	0.329
					TOTAL	8.9E-07	100%		TOTAL	0.735
METALS,INORGANICS, VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg-day)	SFo (risk/(mg/kg-day))	RfDo (mg/kg-day)	(LECR)	(%)	(HQ)		
BARIUM	83.86	92.25	2.5E-03		7.0E-02			0.036	N/A	N/A
SELENIUM	1.85	2.885	7.9E-05		5.0E-03			0.016		
STRONTIUM	331.5	355.6	9.7E-03		6.0E-01			0.016		
NITRATE	104.4	N/A	2.9E-03		1.6E+00			0.002		
1,1,1 - TRICHLOROETHANE	0.1468	0.26	7.1E-06	1.9E+00		5.8E-06	68%			
ATRAZINE	0.2109	1.047	2.9E-05	2.2E-01	3.5E-02	2.7E-06	32%	0.001		
					TOTAL	8.5E-06	100%	0.071		

TABLE D-2.8

HUMAN HEALTH RISK ASSE… …NT COC's: Site 8 - Landfill Pond

CONTAMINANT	SAMPLE MEAN CONCENTRATION	LOGNORMAL 95% UCL FOR MEAN EXPOSURE POINT CONCENTRATION	AVERAGE DAILY INTAKE	ORAL SLOPE FACTOR	ORAL REFERENCE DOSE	CANCER RISK	RELATIVE RISK CONTRIBUTION	HAZARD QUOTIENT	RADIATION DOSE CONVERSION FACTOR	COMMITTED EFFECTIVE DOSE RATE EQUIVELENT
RADIONUCLIDES	(pCi/l)	(pCi/l)	(pCi/day)	SFo (risk/pCi)		(LECR)	(%)	(HQ)	(mrem/pCi)	(mrem/year)
PLUTONIUM-239/240	0.006	0.008	0.015	2.3E-10	N/A	1.9E-08	2.1%	N/A	3.5E-03	0.020
STRONTIUM-89,90	0.93	1.202	2.305	3.60E-11		4.5E-07	49.9%		1.4E-04	0.120
TRITIUM	484.691	770.894	1478.427	5.4E-14		4.4E-07	48.0%		6.4E-08	0.035
					TOTAL	9.1E-07	100%		TOTAL	0.174
METALS,INORGANICS, VOA/SVOA/PESTICIDES	(ug/l)	(ug/l)	(mg/kg-day)	SFo (risk/(mg/kg-day))	RfDo (mg/kg-day)	(LECR)	(%)	(HQ)		
BARIUM	637.4	737.5	2.0E-02		7.00E-02			0.289	N/A	N/A
CHROMIUM	8.959	22.5	6.2E-04		0.005 (VI)			0.123		
COBALT	7.419	12.65	3.5E-04							
LITHIUM	46.22	55.86	1.5E-03							
MANGANESE	1619	1735	4.8E-02		5.00E-03			9.507		
MOLYBDENUM	10.07	24.56	6.7E-04		5.00E-03			0.135		
NICKEL	11.75	19.7	5.4E-04		2.00E-02			0.027		
SILVER	5.682	9.152	2.5E-04		5.00E-03			0.050		
STRONTIUM	905.5	1052	2.9E-02		6.00E-01			0.048		
TIN	49.2	127.206	3.5E-03		6.00E-01			0.006		
VANADIUM	25.02	50.854	1.4E-03		7.00E-03			0.199		
ZINC	3194.6	4009	1.1E-01		3.00E-01			0.366		
1,1 DICHLOROETHANE	6.382	7.464	2.0E-04		1.00E-01			0.002		
1,2 DICHLOROETHENE	4.353	5.611	1.5E-04		9.00E-03			0.017		
2 - BUTANONE	10.65	18.1	5.0E-04							
4 - METHYL- 2 - PENTANONE	9.03	13.36	3.7E-04	7.80E-02	2.00E-03	1.2E-05	100.0%	0.183		
ACETONE	34.91	60.79	1.7E-03		1.00E-01			0.017		
CHLOROETHANE	15.24	19.46	5.3E-04							
ETHYL BENZENE	12.97	15.08	4.1E-04							
TOLUENE	44.32	53.7	1.5E-03							
TOTAL XYLENES	14.76	17.3	4.7E-04							
0 - XYLENE	5.167	9.81	2.7E-04							
2 - METHYLNAPTHALENE	22.33	34.18	9.4E-04							
NAPHTHALENE	20.67	30.97	8.5E-04							
					TOTAL	1.2E-05	100%	10.968		

Table 1: Total Radiochemistry
(First of five pages)

Pond	Analyte	Sample Size	CWQCC Standard	Percent Above Standard	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	AMERICIUM-241	82	0.05	0	0.0044	0.0029	0.01	0.008
	CESIUM-137	76	80	0	0.0961	0.0659	0.3	0.3039
	GROSS ALPHA	67	11	5.97	3.4365	1	3	1.5964
	GROSS BETA	63	19	3.17	4.6234	3	5.5	2.441
	PLUTONIUM-239/240	83	0.05	0	0.0044	0.0019	0.01	0.0049
	STRONTIUM-89,90	57	8	0	0.5458	0.5	0.92	0.64
	TRITIUM	53	500	3.77	51.4518	71.7449	200	210
	URANIUM-233,234	60	10	0	0.4577	0.3055	0.7865	0.2897
	URANIUM-235	56	10	0	0.0396	0	0.1	0.0779
	URANIUM-238	54	10	0	0.3601	0.2	0.6584	0.3
A1/A2	AMERICIUM-241	9	0.05	11.11	0.0181	0.0091	0.0371	0.012
	CESIUM-137	12	80	0	0.1075	0.018	0.53	0.2775
	GROSS ALPHA	8	11	12.5	6.3954	6.15	8.1	4.3385
	GROSS BETA	10	19	10	13.5209	13	17.69	4.84
	PLUTONIUM-239/240	14	0.05	0	0.0217	0.0193	0.035	0.02
	STRONTIUM-89,90	12	8	0	0.5888	0.68	0.81	0.3184
	TRITIUM	4	500	0	55.75	69.5	130	138.5
	URANIUM-233,234	14	10	0	3.3456	3.25	4.1	1.395
	URANIUM-235	14	10	0	0.2034	0.26	0.3206	0.2356
	URANIUM-238	14	10	0	4.9166	4.9705	6.5	1.854

Table 1: Total Radiochemistry
(Second of five pages)

Pond	Analyte	Sample Size	CWQCC Standard	Percent Above Standard	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	AMERICIUM-241	48	0.05	0	0.0042	0.0033	0.0082	0.0052
	CESIUM-137	49	80	0	0.0681	0.0274	0.17	0.1883
	GROSS ALPHA	332	11	0.3	3.7709	3.6875	6.076	2.7755
	GROSS BETA	332	19	0.3	6.083	5.3865	8.161	2.8635
	PLUTONIUM-239/240	55	0.05	0	0.0046	0.003	0.0098	0.0069
	STRONTIUM-89,90	46	8	0	0.3533	0.31	0.56	0.25
	TRITIUM	22	500	4.55	121.2927	83.3024	181.7035	98
	URANIUM-233,234	60	10	0	1.3781	1.2815	2.2495	0.9574
	URANIUM-235	60	10	0	0.0842	0.0729	0.1486	0.0735
	URANIUM-238	59	10	0	1.5419	1.231	3.007	0.95
B1/B2	AMERICIUM-241	9	0.05	11.11	0.0214	0.0142	0.045	0.0246
	CESIUM-137	12	80	0	0.371	0.115	0.665	0.236
	GROSS ALPHA	6	11	0	2.4158	2.245	4.2	1.395
	GROSS BETA	8	19	12.5	8.5975	6.8015	9.2	1.7905
	PLUTONIUM-239/240	14	0.05	35.71	0.0498	0.0374	0.06	0.0393
	STRONTIUM-89,90	12	8	0	0.1786	0.16	0.29	0.1298
	TRITIUM	6	500	16.67	249.5	215	650	396
	URANIUM-233,234	14	10	0	1.3701	1.2095	2.2	0.827
	URANIUM-235	14	10	0	0.0916	0.1018	0.13	0.065
	URANIUM-238	14	10	0	1.2537	1.1825	1.8	0.63

Table 1: Total Radiochemistry
(Third of five pages)

Pond	Analyte	Sample Size	CWQCC Standard	Percent Above Standard	Mean	Median	85th Percentile	Inter-Quartile Range
B3	AMERICIUM-241	5	0.05	20	0.027	0.023	0.062	0.0155
	CESIUM-137	5	80	0	0.211	-0.0432	1.15	0.132
	GROSS ALPHA	3	11	0	0.3296	0.51	0.69	0.9012
	GROSS BETA	4	19	25	17.2075	14.455	32.02	13.015
	PLUTONIUM-239/240	5	0.05	0	0.0181	0.015	0.0399	0.0026
	STRONTIUM-89,90	5	8	0	0.1495	0.18	0.31	0.165
	TRITIUM	2	500	0	51.5	51.5	160	217
	URANIUM-233,234	6	10	0	0.2794	0.2281	0.93	0.335
	URANIUM-235	6	10	0	0.0272	0.0223	0.0635	0.055
	URANIUM-238	6	10	0	0.2881	0.1705	0.93	0.1125
B4/B5	AMERICIUM-241	28	0.05	0	0.0071	0.0051	0.022	0.0088
	CESIUM-137	32	80	0	0.0966	0.013	0.3937	0.2694
	GROSS ALPHA	185	11	0	3.6247	3.268	5.848	3.416
	GROSS BETA	186	19	0	7.6701	7.8205	9.004	2.06
	PLUTONIUM-239/240	36	0.05	0	0.0089	0.0059	0.0174	0.0079
	STRONTIUM-89,90	30	8	0	0.2597	0.2018	0.45	0.2405
	TRITIUM	23	500	8.7	197.8304	124.5024	310	193.3164
	URANIUM-233,234	35	10	0	0.9056	0.72	1.46	0.6238
	URANIUM-235	35	10	0	0.0547	0.0428	0.1105	0.0808
	URANIUM-238	35	10	0	0.7736	0.61	1.114	0.3257

Table 1: Total Radiochemistry
(Fourth of five pages)

Pond	Analyte	Sample Size	CWQCC Standard	Percent Above Standard	Mean	Median	85th Percentile	Inter-Quartile Range
C1	AMERICIUM-241	4	0.05	0	0.0077	0.0032	0.0233	0.0134
	CESIUM-137	5	80	0	0.2612	0.11	0.92	0.5041
	GROSS ALPHA	3	7	0	2.0793	1.828	4.2	3.99
	GROSS BETA	4	5	50	7.076	6.84	12	8.528
	PLUTONIUM-239/240	6	0.05	0	0.0063	0.005	0.0142	0.004
	STRONTIUM-89,90	5	8	0	0.3765	0.41	0.53	0.0875
	TRITIUM	2	500	0	187.5	187.5	330	285
	URANIUM-233,234	6	5	0	0.7965	0.8735	1.1	0.622
	URANIUM-235	6	5	0	0.0704	0.0744	0.098	0.0457
	URANIUM-238	6	5	0	0.5993	0.6129	0.88	0.51
C2	AMERICIUM-241	19	0.05	5.26	0.0117	0.0052	0.017	0.0092
	CESIUM-137	26	80	0	0.094	0.046	0.404	0.1711
	GROSS ALPHA	160	7	10.63	4.4328	4.335	6.6195	3.028
	GROSS BETA	159	5	96.86	7.0019	6.94	8.015	1.397
	PLUTONIUM-239/240	32	0.05	12.5	0.022	0.0127	0.045	0.0169
	STRONTIUM-89,90	24	8	0	0.4519	0.3973	0.67	0.2406
	TRITIUM	20	500	5	85.1089	76.8401	159.9391	132.3759
	URANIUM-233,234	27	5	0	1.2115	1.2	1.798	0.98
	URANIUM-235	27	5	0	0.1277	0.0953	0.2202	0.1482
	URANIUM-238	27	5	0	1.5136	1.3	2	1.0063

Table 1: Total Radiochemistry
(Fifth of five pages)

Pond	Analyte	Sample Size	CWQCC Standard	Percent Above Standard	Mean	Median	85th Percentile	Inter-Quartile Range
LANDFILL	AMERICIUM-241	13	0.05	0	0.0064	0.004	0.0123	0.0053
	CESIUM-137	12	80	0	0.1586	0.1908	0.42	0.3053
	GROSS ALPHA	8	11	0	3.6331	3.2	4.6	2.5955
	GROSS BETA	8	19	0	9.5318	9.4655	12.67	5.235
	PLUTONIUM-239/240	13	0.05	0	0.0063	0.0061	0.009	0.0035
	STRONTIUM-89,90	9	8	0	0.9296	0.89	1.18	0.44
	TRITIUM	8	500	12.5	484.6911	364.9144	500	211.85
	URANIUM-233,234	9	10	0	0.2549	0.23	0.43	0.19
	URANIUM-235	9	10	0	0.0338	0.05	0.08	0.052
	URANIUM-238	9	10	0	0.1028	0.07	0.1737	0.097

Table 2: Total Metals
(First of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	ALUMINUM	110	28.18	.	0.00	0	695.2936	180.0000	1450.0000	549.1000
	ANTIMONY	91	90.11	14	2.20	0	14.2297	9.4000	28.1333	13.1306
	ARSENIC	84	88.10	50	0.00	0	1.7810	1.0000	3.1250	1.4929
	BARIUM	103	18.45	1000	0.00	0	67.6165	57.4000	85.7000	26.9412
	BERYLLIUM	87	93.10	0.0076	6.90	0	0.9425	0.4688	1.9000	0.6471
	CADMIUM	80	100.00	1.5	0.00	0	1.7438	1.5561	2.9905	1.4071
	CALCIUM	125	0.00	.	0.00	0	24924.5720	23000.0000	33900.0000	10300.0000
	CESIUM	92	91.30	.	0.00	1	247.4670	173.9130	471.4286	341.3043
	CHROMIUM	91	83.52	50	0.00	0	4.2341	3.0000	7.3000	4.2857
	COBALT	88	93.18	.	0.00	16	2.3979	1.7889	3.7143	1.8659
	COPPER	93	63.44	16.05	0.00	0	6.1984	4.6286	11.7647	6.8092
	IRON	129	7.75	1000	27.91	0	1335.6364	561.0000	1700.0000	952.0000
	LEAD	104	64.42	6.46	3.85	0	2.0438	1.2583	3.6000	1.8542
	LITHIUM	98	52.04	.	0.00	0	13.7107	4.3800	28.5714	6.8238
	MAGNESIUM	118	10.17	.	0.00	0	5279.6186	5090.0000	7140.0000	1720.0000
	MANGANESE	123	8.94	1000	1.63	0	99.3171	32.2000	125.0000	70.4000
	MERCURY	94	91.49	0.01	8.51	0	0.1397	0.1096	0.1855	0.1084
	MOLYBDENUM	97	87.63	.	0.00	21	5.2789	3.7182	8.6667	5.0526
	NICKEL	92	84.78	125	0.00	0	7.3842	4.7029	13.1000	6.6435
	POTASSIUM	100	32.00	.	0.00	0	1775.3750	1455.2941	3100.0000	1389.5000

Table 2: Total Metals
(Second of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	SELENIUM	92	95.65	10	0.00	0	1.3777	0.9488	2.5000	1.2833
	SILICON	39	0.00	.	0.00	0	5861.8974	4930.0000	10000.0000	4820.0000
	SILVER	88	86.36	0.59	13.64	0	2.8562	2.3077	5.1000	2.9860
	SODIUM	127	0.79	.	0.00	0	17166.9291	15400.0000	24800.0000	9400.0000
	STRONTIUM	106	16.04	.	0.00	0	195.5943	140.0000	222.2222	49.6667
	THALLIUM	96	96.88	0.012	3.13	16	1.0431	0.8944	1.7889	0.9834
	TIN	90	81.11	.	0.00	0	22.6094	13.4111	35.0000	17.6667
	VANADIUM	92	70.65	.	0.00	0	7.8359	3.5313	14.9000	6.5701
	ZINC	123	28.46	45	20.33	0	38.2911	16.0000	67.6000	24.6000
A1/A2	ALUMINUM	13	38.46	.	0.00	0	209.6346	81.0000	320.0000	116.5000
	ANTIMONY	13	100.00	14	0.00	0	9.3923	8.8000	20.4800	5.5733
	ARSENIC	13	23.08	50	0.00	0	3.9154	4.1000	6.8000	4.6000
	BARIUM	13	0.00	1000	0.00	0	50.4769	53.0000	60.9000	13.4000
	BERYLLIUM	13	100.00	0.0076	0.00	0	0.3692	0.3000	0.7143	0.2143
	CADMIUM	8	100.00	1.5	0.00	0	1.4625	1.3500	2.2000	1.0500
	CALCIUM	13	0.00	.	0.00	0	27984.6154	25800.0000	43200.0000	13400.0000
	CESIUM	13	92.31	.	0.00	0	153.4615	120.0000	375.0000	216.6667
	CHROMIUM	13	100.00	50	0.00	0	1.5385	1.4500	2.7500	0.8667
	COBALT	13	100.00	.	0.00	0	1.5115	1.4286	2.8800	1.0095
	COPPER	11	90.91	16.05	0.00	0	2.0682	1.8800	3.7000	1.7700

Table 2: Total Metals
(Third of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A1/A2	IRON	13	46.15	1000	7.69	0	211.1846	120.0000	248.0000	100.0000
	LEAD	13	69.23	6.46	7.69	0	2.0231	0.9333	4.1000	1.2000
	LITHIUM	13	0.00	.	0.00	0	44.7769	45.0000	51.1000	6.5000
	MAGNESIUM	13	0.00	.	0.00	0	30046.1538	30000.0000	35100.0000	3900.0000
	MANGANESE	13	0.00	1000	0.00	0	128.1769	46.0000	422.0000	49.0000
	MERCURY	13	92.31	0.01	7.69	0	0.1200	0.1077	0.1846	0.0923
	MOLYBDENUM	13	84.62	.	0.00	0	2.9115	2.6667	5.0000	2.7000
	NICKEL	13	53.85	125	0.00	0	5.9692	4.8000	9.8000	3.6000
	POTASSIUM	13	0.00	.	0.00	0	7693.0769	7850.0000	8870.0000	700.0000
	SELENIUM	13	84.62	10	0.00	0	1.4000	1.1429	2.8571	1.2000
	SILICON	14	21.43	.	0.00	0	1075.8929	532.5000	2380.0000	1674.0000
	SILVER	13	100.00	0.59	0.00	0	1.9462	1.6000	3.5714	1.8905
	SODIUM	13	0.00	.	0.00	0	171384.6154	170000.0000	209000.0000	35000.0000
	STRONTIUM	13	0.00	.	0.00	0	339.6154	330.0000	432.0000	94.0000
	THALLIUM	13	92.31	0.012	7.69	2	1.5455	1.0667	3.0000	1.4667
	TIN	12	100.00	.	0.00	0	7.7458	6.7167	11.8400	4.8317
	VANADIUM	13	46.15	.	0.00	0	3.3692	3.2000	6.6000	1.6200
	ZINC	13	76.92	45	0.00	0	5.7000	3.3333	19.0000	3.3000

Table 2: Total Metals
(Fourth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	ALUMINUM	21	28.57	.	0.00	0	320.0286	307.0000	630.0000	506.2000
	ANTIMONY	21	100.00	14	0.00	0	12.6476	9.3333	24.6500	10.9000
	ARSENIC	21	85.71	50	0.00	0	1.2762	1.0000	2.0000	0.9056
	BARIUM	21	4.76	1000	0.00	0	84.3238	82.8000	100.0000	12.2000
	BERYLLIUM	21	95.24	0.0076	4.76	0	0.6262	0.4667	0.8667	0.4333
	CADMIUM	18	100.00	1.5	0.00	0	1.5889	1.3750	2.5000	1.0000
	CALCIUM	21	0.00	.	0.00	0	45395.2381	45500.0000	51700.0000	6300.0000
	CESIUM	20	75.00	.	0.00	0	218.8000	65.8333	450.0000	219.0476
	CHROMIUM	21	95.24	50	0.00	0	2.2690	2.0000	3.5000	1.5500
	COBALT	21	100.00	.	0.00	1	2.2575	1.7071	3.6250	1.8619
	COPPER	20	70.00	16.05	5.00	0	5.0450	2.4250	12.8000	6.6750
	IRON	21	23.81	1000	0.00	0	237.5357	142.0000	480.0000	367.2000
	LEAD	20	60.00	6.46	5.00	0	2.4550	1.4500	3.1000	2.1472
	LITHIUM	17	35.29	.	0.00	0	13.6206	9.6000	16.6667	6.4000
	MAGNESIUM	21	0.00	.	0.00	0	11530.4762	11400.0000	14200.0000	3260.0000
	MANGANESE	22	4.55	1000	0.00	0	53.2091	39.2000	92.5000	61.4000
	MERCURY	24	100.00	0.01	0.00	0	0.0958	0.0913	0.1652	0.0957
	MOLYBDENUM	17	82.35	.	0.00	1	6.5969	6.5000	13.0000	5.9167
	NICKEL	21	76.19	125	0.00	0	7.2357	4.9500	15.3333	4.1667
	POTASSIUM	21	4.76	.	0.00	0	5435.7143	4130.0000	7900.0000	3930.0000

Table 2: Total Metals
(Fifth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	SELENIUM	21	76.19	10	0.00	0	1.6024	1.5000	2.5000	1.4500
	SILICON	9	0.00	.	0.00	0	2891.1111	2950.0000	3450.0000	920.0000
	SILVER	21	100.00	0.59	0.00	0	1.9595	1.5000	2.9500	1.4667
	SODIUM	21	0.00	.	0.00	0	38071.4286	38300.0000	47700.0000	15600.0000
	STRONTIUM	18	5.56	.	0.00	0	301.6667	295.0000	360.0000	77.0000
	THALLIUM	21	100.00	0.012	0.00	3	1.0056	0.8333	1.5000	0.9500
	TIN	16	93.75	.	0.00	0	13.6531	8.1250	26.6667	12.8667
	VANADIUM	21	66.67	.	0.00	0	3.7167	2.5000	4.5000	1.8000
	ZINC	21	33.33	45	9.52	0	20.3286	14.5500	29.0000	14.5000
B1/B2	ALUMINUM	12	50.00	.	0.00	0	152.6458	84.2000	350.0000	187.9000
	ANTIMONY	12	100.00	14	0.00	0	10.9833	8.7867	20.4800	8.8033
	ARSENIC	9	44.44	50	0.00	0	2.1444	1.9000	3.6000	1.7667
	BARIUM	12	33.33	1000	0.00	0	40.8167	41.8500	79.3000	49.6500
	BERYLLIUM	12	91.67	0.0076	8.33	0	0.3792	0.2813	0.5000	0.2625
	CADMIUM	10	100.00	1.5	0.00	0	1.5800	1.5667	2.2000	0.7000
	CALCIUM	12	0.00	.	0.00	0	21900.0000	19000.0000	30000.0000	8250.0000
	CESIUM	12	100.00	.	0.00	0	233.3333	225.0000	450.0000	300.0000
	CHROMIUM	11	100.00	50	0.00	0	1.9545	1.8333	3.2800	1.9000
	COBALT	12	100.00	.	0.00	0	1.8375	1.4200	2.8800	1.2700
	COPPER	12	100.00	16.05	0.00	0	1.8875	1.6750	3.6000	1.3100

Table 2: Total Metals
(Sixth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B1/B2	IRON	12	33.33	1000	0.00	0	271.8333	239.0000	470.0000	206.0000
	LEAD	12	50.00	6.46	8.33	0	2.1708	0.9167	4.8000	2.0667
	LITHIUM	12	16.67	.	0.00	0	19:3167	16.5500	23.6000	10.0000
	MAGNESIUM	12	0.00	.	0.00	0	20141.6667	21450.0000	24500.0000	8550.0000
	MANGANESE	12	0.00	1000	0.00	0	74.5250	55.8500	138.0000	70.4500
	MERCURY	12	100.00	0.01	0.00	0	0.1000	0.1000	0.1692	0.0923
	MOLYBDENUM	12	100.00	.	0.00	1	3.0091	2.9000	4.5600	2.9000
	NICKEL	12	91.67	125	0.00	0	4.9500	3.8167	9.8000	3.1667
	POTASSIUM	12	0.00	.	0.00	0	5366.6667	5315.0000	6410.0000	1425.0000
	SELENIUM	11	100.00	10	0.00	0	0.8955	0.8250	1.3333	0.5000
	SILICON	14	28.57	.	0.00	0	1101.3571	845.0000	2140.0000	1473.5000
	SILVER	12	91.67	0.59	8.33	0	6.6667	2.2208	4.5333	1.8333
	SODIUM	12	0.00	.	0.00	0	62433.3333	63300.0000	73200.0000	16100.0000
	STRONTIUM	12	8.33	.	0.00	0	273.0000	245.5000	301.0000	58.0000
	THALLIUM	12	100.00	0.012	0.00	1	0.8273	0.7000	1.2667	0.5667
	TIN	11	100.00	.	0.00	0	12.7000	7.8000	25.9333	8.6333
	VANADIUM	12	91.67	.	0.00	0	2.3083	2.2083	4.3333	1.9183
	ZINC	12	83.33	45	0.00	0	6.6583	4.1500	22.0000	4.8750

Table 2: Total Metals
(Seventh of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B3	ALUMINUM	5	0.00	.	0.00	0	526.6000	520.0000	1000.0000	481.0000
	ANTIMONY	5	100.00	14	0.00	0	11.8400	8.5333	21.1000	10.0667
	ARSENIC	4	100.00	50	0.00	0	0.9750	0.8000	2.0000	1.0500
	BARIUM	5	20.00	1000	0.00	0	16.4900	16.0000	30.0000	12.7000
	BERYLLIUM	5	100.00	0.0076	0.00	0	0.3700	0.3333	0.6667	0.1500
	CADMIUM	3	100.00	1.5	0.00	0	1.8667	2.2000	2.3000	1.2000
	CALCIUM	5	0.00	.	0.00	0	33940.0000	36000.0000	40000.0000	5500.0000
	CESIUM	5	80.00	.	0.00	0	165.0000	125.0000	375.0000	200.0000
	CHROMIUM	5	80.00	50	0.00	0	3.1700	2.7500	6.4000	1.4000
	COBALT	5	80.00	.	0.00	0	2.0700	2.1000	3.6500	1.2000
	COPPER	4	50.00	16.05	0.00	0	4.7125	4.6000	7.3000	4.3750
	IRON	5	60.00	1000	0.00	0	136.2000	79.5000	254.0000	152.5000
	LEAD	5	0.00	6.46	20.00	0	3.7200	3.6000	6.6000	2.3000
	LITHIUM	5	40.00	.	0.00	0	8.8600	9.1000	19.0000	9.0333
	MAGNESIUM	5	0.00	.	0.00	0	6624.0000	6390.0000	8100.0000	560.0000
	MANGANESE	5	0.00	1000	0.00	0	43.3600	37.0000	63.0000	21.3000
	MERCURY	5	100.00	0.01	0.00	0	0.1000	0.1000	0.1667	0.0667
	MOLYBDENUM	5	100.00	.	0.00	0	4.8800	5.0000	9.0000	3.1000
	NICKEL	5	80.00	125	0.00	0	6.3500	5.3500	9.8000	4.3000
	POTASSIUM	5	0.00	.	0.00	0	13404.0000	14000.0000	16000.0000	2500.0000

Table 2: Total Metals
(Eighth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B3	SELENIUM	5	100.00	10	0.00	0	1.1400	0.7333	2.6667	0.7333
	SILICON	6	0.00	.	0.00	0	4413.3333	4525.0000	5010.0000	500.0000
	SILVER	5	100.00	0.59	0.00	0	2.3800	2.5000	3.7500	2.1500
	SODIUM	5	0.00	.	0.00	0	30300.0000	32000.0000	36000.0000	5200.0000
	STRONTIUM	5	0.00	.	0.00	0	169.6000	158.0000	230.0000	22.0000
	THALLIUM	5	100.00	0.012	0.00	0	1.1400	0.9333	2.0000	0.7000
	TIN	5	100.00	.	0.00	0	10.1900	7.4000	19.4500	5.6000
	VANADIUM	5	40.00	.	0.00	0	5.7000	4.8000	9.7000	4.5000
	ZINC	5	20.00	45	60.00	0	45.9000	46.5000	59.9000	14.4000
B4/B5	ALUMINUM	24	20.83	.	0.00	0	336.8292	241.5000	500.0000	420.0000
	ANTIMONY	25	100.00	14	0.00	0	12.0440	8.8000	21.1000	10.1667
	ARSENIC	24	83.33	50	0.00	0	1.3625	1.1000	2.4000	1.1500
	BARIUM	24	8.33	1000	0.00	0	65.1312	66.7000	83.6000	15.9500
	BERYLLIUM	25	96.00	0.0076	4.00	0	0.5640	0.4500	0.9000	0.5000
	CADMIUM	22	100.00	1.5	0.00	0	1.6795	1.4167	2.6250	1.2500
	CALCIUM	25	0.00	.	0.00	0	42540.0000	41800.0000	48000.0000	7800.0000
	CESIUM	26	84.62	.	0.00	0	200.3077	61.2500	437.5000	216.6667
	CHROMIUM	25	100.00	50	0.00	0	2.3220	2.0000	3.5000	1.7000
	COBALT	25	92.00	.	0.00	1	2.6646	1.9333	4.3000	2.5583
	COPPER	25	52.00	16.05	0.00	0	5.4120	4.5000	10.4000	6.2000

Table 2: Total Metals
(Ninth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B4/B5	IRON	25	32.00	1000	0.00	0	261.3640	206.0000	515.0000	364.1000
	LEAD	23	56.52	6.46	0.00	0	2.0435	1.8000	3.6000	2.5857
	LITHIUM	22	36.36	.	0.00	1	14.3643	9.9000	32.2000	11.3667
	MAGNESIUM	25	0.00	.	0.00	0	9193.6000	8380.0000	14200.0000	1030.0000
	MANGANESE	25	12.00	1000	0.00	0	89.5220	70.2000	175.0000	80.9000
	MERCURY	26	96.15	0.01	3.85	0	0.1212	0.1000	0.1760	0.1020
	MOLYBDENUM	22	90.91	.	0.00	2	7.9675	6.5000	15.1667	9.5583
	NICKEL	25	92.00	125	0.00	0	5.9120	4.6000	10.0000	5.2500
	POTASSIUM	25	4.00	.	0.00	0	9146.8000	10100.0000	11900.0000	3840.0000
	SELENIUM	25	80.00	10	0.00	0	1.6400	1.1429	3.2000	1.6190
	SILICON	8	0.00	.	0.00	0	4122.5000	4045.0000	4580.0000	630.0000
	SILVER	24	91.67	0.59	8.33	0	2.1521	1.7708	3.7500	2.1375
	SODIUM	25	0.00	.	0.00	0	33988.0000	33000.0000	44900.0000	9900.0000
	STRONTIUM	22	9.09	.	0.00	0	255.0000	228.5000	370.0000	40.0000
	THALLIUM	25	96.00	0.012	4.00	6	0.9605	0.8000	2.0000	1.0000
	TIN	22	95.45	.	0.00	1	12.3643	10.0000	19.4500	6.5000
	VANADIUM	25	64.00	.	0.00	0	4.3760	3.5000	6.7000	3.1000
	ZINC	25	28.00	45	20.00	0	35.3240	36.8000	52.9000	19.6000

Table 2: Total Metals
(Tenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C1	ALUMINUM	5	0.00	.	0.00	0	531.2000	411.0000	1040.0000	180.0000
	ANTIMONY	5	80.00	14	20.00	0	15.7200	12.8000	32.2000	14.1000
	ARSENIC	5	80.00	50	0.00	0	0.9600	0.9000	2.0000	0.4000
	BARIUM	5	0.00	1000	0.00	0	91.3200	94.2000	120.0000	17.8000
	BERYLLIUM	5	60.00	0.0076	40.00	0	0.6000	0.5000	1.2000	0.3333
	CADMIUM	2	100.00	1.5	0.00	0	1.8250	1.8250	2.3000	0.9500
	CALCIUM	5	0.00	.	0.00	0	44420.0000	46800.0000	48500.0000	3200.0000
	CESIUM	5	80.00	.	0.00	0	165.0000	125.0000	375.0000	200.0000
	CHROMIUM	5	100.00	50	0.00	0	1.8000	1.3667	2.7500	1.5833
	COBALT	5	100.00	.	0.00	0	1.8500	1.3333	3.6500	1.2000
	COPPER	4	100.00	16.05	0.00	0	2.2250	2.1333	3.1333	1.3833
	IRON	5	0.00	1000	40.00	0	904.8000	970.0000	1230.0000	370.0000
	LEAD	5	0.00	6.46	0.00	0	2.9600	2.9000	5.4000	1.7000
	LITHIUM	5	20.00	.	0.00	0	5.4000	4.4000	8.3000	2.0000
	MAGNESIUM	5	0.00	.	0.00	0	9036.0000	8540.0000	10100.0000	1700.0000
	MANGANESE	5	0.00	1000	0.00	0	136.5200	135.0000	240.0000	105.0000
	MERCURY	5	100.00	0.01	0.00	0	0.1000	0.1000	0.1667	0.0667
	MOLYBDENUM	5	80.00	.	0.00	0	3.5900	2.8500	6.6000	3.0000
	NICKEL	5	100.00	125	0.00	0	3.8300	2.5000	7.3500	3.3500
	POTASSIUM	5	40.00	.	0.00	0	1524.0000	1366.6667	2300.0000	670.0000

Table 2: Total Metals
(Eleventh of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C1	SELENIUM	5	80.00	10	0.00	0	1.3300	1.3333	2.6667	0.9000
	SILICON	7	0.00	.	0.00	0	6815.7143	7060.0000	7330.0000	1380.0000
	SILVER	5	100.00	0.59	0.00	0	2.3800	2.5000	3.7500	2.1500
	SODIUM	5	0.00	.	0.00	0	22920.0000	22000.0000	26400.0000	5500.0000
	STRONTIUM	5	0.00	.	0.00	0	241.8000	241.0000	260.0000	28.0000
	THALLIUM	5	100.00	0.012	0.00	0	1.1400	0.9333	2.0000	0.7000
	TIN	5	100.00	.	0.00	0	9.2500	6.5000	19.4500	4.3667
	VANADIUM	5	80.00	.	0.00	0	2.7700	3.2500	3.9000	1.9000
	ZINC	5	100.00	45	0.00	0	2.6500	3.1000	3.6000	0.6500
C2	ALUMINUM	22	22.73	.	0.00	0	176.7250	141.5000	385.0000	177.5000
	ANTIMONY	22	100.00	14	0.00	0	12.3864	10.1667	22.2000	9.3333
	ARSENIC	22	36.36	50	0.00	0	2.4364	2.4500	4.4000	2.0000
	BARIUM	22	0.00	1000	0.00	0	83.8636	81.4000	90.3000	10.1000
	BERYLLIUM	22	95.45	0.0076	4.55	0	0.5955	0.5476	0.8571	0.4762
	CADMIUM	21	95.24	1.5	4.76	0	1.7024	1.5000	2.7000	1.5000
	CALCIUM	22	0.00	.	0.00	0	45259.0909	41650.0000	56000.0000	16200.0000
	CESIUM	23	82.61	.	0.00	0	198.3913	50.0000	400.0000	275.0000
	CHROMIUM	22	100.00	50	0.00	0	2.4091	2.0000	4.2000	1.8000
	COBALT	22	100.00	.	0.00	1	2.7881	2.2222	4.5000	1.7000
	COPPER	22	72.73	16.05	0.00	0	4.1841	3.0000	7.6000	4.4500

Table 2: Total Metals
(Twelfth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C2	IRON	22	18.18	1000	4.55	0	272.0455	220.0000	466.0000	206.3000
	LEAD	22	68.18	6.46	18.18	0	5.5977	1.0750	7.4000	2.3444
	LITHIUM	18	38.89	.	0.00	1	13.5559	9.2000	16.6667	4.7000
	MAGNESIUM	22	0.00	.	0.00	0	14304.0909	14350.0000	16400.0000	2600.0000
	MANGANESE	22	13.64	1000	0.00	0	241.4114	94.5500	629.0000	245.0000
	MERCURY	22	90.91	0.01	9.09	0	0.1205	0.1050	0.1800	0.1100
	MOLYBDENUM	18	88.89	.	0.00	2	9.2031	5.7500	17.3333	10.0417
	NICKEL	22	90.91	125	0.00	0	6.2773	4.5500	10.0000	6.8000
	POTASSIUM	22	4.55	.	0.00	0	6265.0000	6005.0000	7070.0000	1320.0000
	SELENIUM	22	81.82	10	4.55	0	1.8500	1.4643	2.8571	1.5000
	SILICON	1	0.00	.	0.00	0	910.0000	910.0000	910.0000	0.0000
	SILVER	22	95.45	0.59	4.55	0	2.0273	1.7946	3.1250	2.0000
	SODIUM	22	0.00	.	0.00	0	48968.1818	48600.0000	57300.0000	13900.0000
	STRONTIUM	20	10.00	.	0.00	0	331.4500	326.0000	380.0000	44.5000
	THALLIUM	22	100.00	0.012	0.00	8	0.9250	0.6833	1.4500	0.9333
	TIN	18	100.00	.	0.00	1	12.1471	9.7500	15.0000	6.8333
	VANADIUM	22	81.82	.	0.00	0	3.3091	2.1667	3.7500	1.9500
	ZINC	22	50.00	45	13.64	0	40.3932	6.8500	28.9000	14.8000

Table 2: Total Metals
(Thirteenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
LANDFILL	ALUMINUM	17	23.53	.	0.00	0	2614.9059	301.0000	4090.0000	1283.3333
	ANTIMONY	17	82.35	14	17.65	1	19.2344	15.0000	30.0000	15.9167
	ARSENIC	15	53.33	50	0.00	0	2.6400	2.4000	4.6000	1.8000
	BARIUM	17	0.00	1000	5.88	0	637.4118	564.0000	780.0000	69.0000
	BERYLLIUM	17	100.00	0.0076	0.00	0	0.7912	0.4500	1.2500	0.5714
	CADMIUM	16	81.25	1.5	18.75	1	2.5433	1.7000	3.9000	2.4000
	CALCIUM	17	0.00	.	0.00	0	151411.7647	142000.0000	185000.0000	7000.0000
	CESIUM	17	100.00	.	0.00	1	252.9375	193.7500	437.5000	307.2500
	CHROMIUM	17	70.59	50	0.00	0	8.9588	5.0000	21.8000	8.8000
	COBALT	16	50.00	.	0.00	3	7.4192	5.8000	15.9000	1.9333
	COPPER	17	70.59	16.05	11.76	0	12.0765	5.0000	16.6667	7.5000
	IRON	17	0.00	1000	100.00	0	78476.4706	75000.0000	84300.0000	12500.0000
	LEAD	17	23.53	6.46	17.65	0	4.1588	3.0000	9.5000	3.5000
	LITHIUM	17	23.53	.	0.00	0	46.2176	38.7000	75.0000	10.1000
	MAGNESIUM	17	0.00	.	0.00	0	34682.3529	33000.0000	41600.0000	2800.0000
	MANGANESE	17	0.00	1000	100.00	0	1619.4118	1570.0000	1840.0000	260.0000
	MERCURY	17	94.12	0.01	5.88	0	0.1076	0.1000	0.1750	0.1000
	MOLYBDENUM	17	70.59	.	0.00	5	10.0708	6.5833	21.3000	13.6083
	NICKEL	17	76.47	125	0.00	0	11.7500	9.8000	21.6000	9.2500
	POTASSIUM	17	5.88	.	0.00	0	6404.7059	6100.0000	7970.0000	850.0000

Table 2: Total Metals
(Fourteenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
LANDFILL	SELENIUM	17	94.12	10	0.00	1	2.1219	0.9500	3.7500	1.6250
	SILICON	10	0.00	.	0.00	0	10385.0000	10300.0000	11900.0000	1500.0000
	SILVER	17	70.59	0.59	29.41	0	5.6824	4.0000	11.1000	4.2333
	SODIUM	17	0.00	.	0.00	0	71005.8824	67100.0000	83300.0000	11800.0000
	STRONTIUM	17	11.76	.	0.00	0	905.4706	872.0000	1150.0000	95.0000
	THALLIUM	17	100.00	0.012	0.00	3	0.8679	0.7500	1.3333	0.5667
	TIN	17	58.82	.	0.00	1	49.2062	37.1000	75.0000	46.3250
	VANADIUM	17	41.18	.	0.00	0	25.0265	14.4000	27.3000	18.7000
	ZINC	17	0.00	45	100.00	0	3194.6471	2360.0000	3110.0000	440.0000

Table 3: Dissolved Metals
(First of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	ALUMINUM	104	61.54	87	7.69	0	65.6784	31.4500	100.0000	39.9786
	ANTIMONY	68	77.94	.	0.00	8	15.4642	12.3000	23.7229	11.4071
	ARSENIC	66	95.45	.	0.00	0	1.5795	0.9345	2.5000	1.0545
	BARIUM	117	36.75	.	0.00	0	51.1179	43.4000	67.8000	25.8500
	BERYLLIUM	61	90.16	.	0.00	0	1.4328	0.7692	2.1000	1.3487
	CADMIUM	49	95.92	.	0.00	0	1.9582	1.8000	3.1818	1.6606
	CALCIUM	125	0.00	.	0.00	0	24639.5200	22800.0000	33900.0000	10800.0000
	CESIUM	69	89.86	.	0.00	47	82.7955	66.6667	200.0000	105.8333
	CHROMIUM	61	88.52	.	0.00	0	4.1869	2.9500	7.4571	3.7831
	COBALT	58	98.28	.	0.00	10	3.8104	2.1250	6.9375	3.3173
	COPPER	97	62.89	.	0.00	0	7.2402	5.0000	13.8000	8.6500
	IRON	125	33.60	300	14.40	0	150.9772	69.9000	298.0000	145.7000
	LEAD	87	81.61	.	0.00	0	1.3534	0.9333	2.5000	1.4000
	LITHIUM	91	56.04	.	0.00	0	19.6725	4.9000	56.2500	25.1250
	MAGNESIUM	122	14.75	.	0.00	0	5056.9672	5035.0000	6780.0000	1950.0000
	MANGANESE	121	25.62	50	17.36	0	38.5832	14.3000	56.6000	32.2500
	MERCURY	54	85.19	.	0.00	0	0.1319	0.1170	0.1957	0.1149
	MOLYBDENUM	65	89.23	.	0.00	6	30.8475	17.0833	73.5294	50.6324
	NICKEL	57	94.74	.	0.00	0	8.6860	5.5500	18.1818	10.0333
	POTASSIUM	97	37.11	.	0.00	0	1609.4227	1280.0000	2727.2727	1485.0000

Table 3: Dissolved Metals
(Second of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	SELENIUM	57	98.25	.	0.00	1	1.6071	1.2250	2.6667	1.2429
	SILICON	42	4.76	.	0.00	0	5887.8571	4840.0000	10000.0000	5210.0000
	SILVER	70	90.00	.	0.00	5	2.6854	2.0667	4.4667	2.3000
	SODIUM	124	0.81	.	0.00	0	17485.8871	15600.0000	26100.0000	8800.0000
	STRONTIUM	110	23.64	.	0.00	0	210.4291	141.0000	333.3333	53.0000
	THALLIUM	69	97.10	.	0.00	0	2.0217	1.2667	3.5714	1.7571
	TIN	75	78.67	.	0.00	0	66.0113	27.4000	82.0513	56.5000
	VANADIUM	78	83.33	.	0.00	9	3.1667	2.3125	5.7375	2.4375
	ZINC	111	40.54	.	0.00	0	17.5239	9.0000	27.0000	16.1000
A1/A2	ALUMINUM	11	81.82	87	0.00	0	33.8455	21.6000	64.8000	49.6667
	ANTIMONY	13	100.00	.	0.00	0	9.3923	8.8000	20.4800	5.5733
	ARSENIC	12	16.67	.	0.00	0	4.0167	4.5500	5.9000	4.0000
	BARIUM	13	0.00	.	0.00	0	43.6615	48.3000	60.0000	15.1000
	BERYLLIUM	13	100.00	.	0.00	0	0.3769	0.3571	0.7143	0.2143
	CADMIUM	12	91.67	.	0.00	0	1.3875	1.4250	2.2000	0.9125
	CALCIUM	13	0.00	.	0.00	0	27792.3077	25500.0000	43300.0000	12800.0000
	CESIUM	13	92.31	.	0.00	0	150.0000	62.5000	375.0000	212.5000
	CHROMIUM	13	92.31	.	0.00	0	1.6038	1.6400	2.7500	1.4333
	COBALT	13	100.00	.	0.00	0	1.5115	1.4286	2.8800	1.0095
	COPPER	12	75.00	.	0.00	0	2.7625	2.2900	4.5000	2.7883

Table 3: Dissolved Metals
(Third of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A1/A2	IRON	12	66.67	300	0.00	0	18.6500	16.0000	31.5000	18.9500
	LEAD	13	61.54	.	0.00	0	1.3462	0.9000	2.6000	1.5000
	LITHIUM	13	0.00	.	0.00	0	43.4385	44.1000	51.2000	11.9000
	MAGNESIUM	13	0.00	.	0.00	0	30269.2308	31000.0000	34100.0000	2900.0000
	MANGANESE	13	23.08	50	15.38	0	62.6077	15.3000	190.0000	40.4000
	MERCURY	13	92.31	.	0.00	0	0.1415	0.1077	0.1846	0.0923
	MOLYBDENUM	13	69.23	.	0.00	0	3.6423	2.8500	6.8000	3.0667
	NICKEL	13	76.92	.	0.00	0	4.4077	3.3333	9.8000	2.9333
	POTASSIUM	13	0.00	.	0.00	0	7676.9231	7800.0000	8600.0000	900.0000
	SELENIUM	13	100.00	.	0.00	0	1.2538	0.8800	2.8571	1.1429
	SILICON	14	21.43	.	0.00	0	935.1071	478.0000	1840.0000	1195.5000
	SILVER	13	100.00	.	0.00	0	1.9462	1.6000	3.5714	1.8905
	SODIUM	13	0.00	.	0.00	0	173307.6923	180000.000	200000.000	22000.000
	STRONTIUM	13	0.00	.	0.00	0	345.5385	340.0000	442.0000	125.0000
	THALLIUM	13	100.00	.	0.00	0	3.0385	1.2667	9.0000	2.2000
	TIN	13	100.00	.	0.00	0	7.4192	6.9333	11.8400	5.2133
	VANADIUM	13	61.54	.	0.00	0	2.6500	3.0000	3.8000	1.9667
	ZINC	11	100.00	.	0.00	0	3.0182	2.0000	7.5000	2.4000

Table 3: Dissolved Metals
(Fourth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	ALUMINUM	32	68.75	87	0.00	0	23.8234	18.3333	36.0000	19.1333
	ANTIMONY	32	93.75	.	0.00	0	13.9141	10.6667	25.0000	13.1750
	ARSENIC	32	81.25	.	0.00	0	1.4281	1.0625	2.6000	1.3750
	BARIUM	32	3.13	.	0.00	0	77.2453	74.5000	91.4000	16.2000
	BERYLLIUM	32	96.88	.	0.00	0	0.5406	0.4600	0.8400	0.4100
	CADMIUM	30	96.67	.	0.00	0	1.6300	1.4250	2.5385	1.3846
	CALCIUM	32	0.00	.	0.00	0	43712.5000	44350.0000	51700.0000	10450.0000
	CESIUM	28	92.86	.	0.00	1	90.0370	50.0000	142.8571	75.0000
	CHROMIUM	32	100.00	.	0.00	0	2.4219	2.0250	4.5000	1.6321
	COBALT	32	96.88	.	0.00	1	2.9742	1.8000	5.1429	2.3500
	COPPER	32	78.13	.	0.00	0	5.0008	2.4857	10.7500	3.1071
	IRON	30	73.33	300	0.00	0	14.0825	4.9500	28.2000	13.2500
	LEAD	32	71.88	.	0.00	0	1.0125	0.8438	1.9000	1.0000
	LITHIUM	25	36.00	.	0.00	2	12.1370	8.4000	14.5000	7.4000
	MAGNESIUM	32	0.00	.	0.00	0	10944.3750	10500.0000	13600.0000	3665.0000
	MANGANESE	35	20.00	50	17.14	0	28.5329	11.0000	54.5000	41.8000
	MERCURY	33	84.85	.	0.00	0	0.3133	0.1143	0.1929	0.1071
	MOLYBDENUM	25	84.00	.	0.00	2	9.0630	6.5000	14.8571	8.0429
	NICKEL	32	90.63	.	0.00	0	6.6797	4.4875	14.2000	7.2929
	POTASSIUM	32	3.13	.	0.00	0	6488.7500	7135.0000	9290.0000	4150.0000

Table 3: Dissolved Metals
(Fifth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	SELENIUM	32	78.13	.	0.00	0	1.7969	1.5528	3.4000	1.6944
	SILICON	9	0.00	.	0.00	0	2426.6667	2230.0000	3260.0000	850.0000
	SILVER	32	96.88	.	0.00	0	2.0734	1.7222	3.7500	1.8389
	SODIUM	32	0.00	.	0.00	0	37703.1250	36250.0000	48400.0000	10650.0000
	STRONTIUM	26	11.54	.	0.00	0	286.3077	274.0000	348.0000	90.0000
	THALLIUM	31	100.00	.	0.00	0	1.8468	0.8571	3.3333	1.6500
	TIN	24	95.83	.	0.00	2	13.3273	7.6000	25.0000	8.0000
	VANADIUM	32	84.38	.	0.00	1	2.5129	2.0000	4.2857	2.3714
	ZINC	32	46.88	.	0.00	0	17.8422	10.2500	30.9000	14.4500
B1/B2	ALUMINUM	9	88.89	87	0.00	0	38.4889	33.8000	64.8000	21.6000
	ANTIMONY	12	91.67	.	0.00	0	12.1333	10.2950	20.4800	10.4800
	ARSENIC	11	45.45	.	0.00	0	1.7636	1.1000	4.1000	2.9250
	BARIUM	11	45.45	.	0.00	0	34.8182	28.6000	70.6000	52.7500
	BERYLLIUM	11	100.00	.	0.00	0	0.3182	0.3125	0.5000	0.2500
	CADMIUM	10	100.00	.	0.00	0	1.5800	1.5667	2.2000	0.7000
	CALCIUM	12	0.00	.	0.00	0	20666.6667	18700.0000	26100.0000	7550.0000
	CESIUM	12	100.00	.	0.00	1	209.0909	200.0000	400.0000	300.0000
	CHROMIUM	12	100.00	.	0.00	0	1.8750	1.7367	3.2800	1.6200
	COBALT	12	100.00	.	0.00	0	1.8375	1.4200	2.8800	1.2700
	COPPER	12	83.33	.	0.00	0	2.5750	2.0150	3.7600	2.2375

Table 3: Dissolved Metals
(Sixth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B1/B2	IRON	12	50.00	300	0.00	0	35.4750	32.4250	63.5000	24.7000
	LEAD	12	58.33	.	0.00	0	2.7625	0.8250	3.1500	1.1500
	LITHIUM	11	27.27	.	0.00	0	16.5455	12.7000	21.0000	9.3500
	MAGNESIUM	12	0.00	.	0.00	0	19891.6667	22500.0000	23800.0000	8750.0000
	MANGANESE	11	36.36	50	0.00	0	18.2091	5.9000	43.0000	30.7500
	MERCURY	12	100.00	.	0.00	0	0.1000	0.1000	0.1692	0.0923
	MOLYBDENUM	12	91.67	.	0.00	0	7.4208	3.1167	8.8000	3.7833
	NICKEL	12	91.67	.	0.00	0	4.2542	3.7500	7.1333	3.6417
	POTASSIUM	12	8.33	.	0.00	0	4991.6667	5230.0000	6790.0000	2055.0000
	SELENIUM	12	100.00	.	0.00	0	0.8667	0.7700	1.3333	0.4800
	SILICON	14	14.29	.	0.00	0	1112.3214	639.5000	2360.0000	1434.0000
	SILVER	12	100.00	.	0.00	0	2.1333	2.0875	4.0000	1.5583
	SODIUM	12	8.33	.	0.00	0	60254.1667	65000.0000	74400.0000	13250.0000
	STRONTIUM	12	8.33	.	0.00	0	269.0833	241.0000	295.0000	48.5000
	THALLIUM	12	91.67	.	0.00	0	1.0333	1.0000	1.5000	0.9083
	TIN	12	100.00	.	0.00	0	12.2583	8.2333	25.9333	7.6367
	VANADIUM	12	91.67	.	0.00	0	2.2167	1.9500	4.3333	1.5300
	ZINC	12	83.33	.	0.00	0	4.2750	2.8125	7.0000	3.8250

Table 3: Dissolved Metals
(Seventh of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B3	ALUMINUM	4	75.00	87	25.00	0	86.6000	54.0000	220.0000	118.8000
	ANTIMONY	5	80.00	.	0.00	0	13.5400	14.0000	21.1000	8.5333
	ARSENIC	5	100.00	.	0.00	0	0.8500	0.6000	2.0000	0.6500
	BARIUM	5	40.00	.	0.00	0	13.6200	12.0000	30.0000	13.9500
	BERYLLIUM	5	100.00	.	0.00	0	0.3700	0.3333	0.6667	0.1500
	CADMIUM	3	100.00	.	0.00	0	1.8667	2.2000	2.3000	1.2000
	CALCIUM	5	0.00	.	0.00	0	33780.0000	34000.0000	43000.0000	6600.0000
	CESIUM	5	100.00	.	0.00	0	163.0000	125.0000	375.0000	210.0000
	CHROMIUM	5	100.00	.	0.00	0	2.0500	2.0500	3.4500	1.4167
	COBALT	5	100.00	.	0.00	0	1.8500	1.3333	3.6500	1.2000
	COPPER	5	40.00	.	0.00	0	5.8900	2.7000	17.0000	2.6000
	IRON	5	40.00	300	0.00	0	60.3800	37.0000	186.0000	36.0000
	LEAD	5	40.00	.	0.00	0	1.6700	1.5000	3.0000	2.4000
	LITHIUM	5	40.00	.	0.00	0	8.2200	7.6000	19.0000	7.3333
	MAGNESIUM	5	0.00	.	0.00	0	6616.0000	6510.0000	8500.0000	680.0000
	MANGANESE	5	0.00	50	20.00	0	40.3000	33.0000	66.0000	8.7000
	MERCURY	5	100.00	.	0.00	0	0.1000	0.1000	0.1667	0.0667
	MOLYBDENUM	5	40.00	.	0.00	0	9.4300	6.6500	16.0000	10.1000
	NICKEL	5	100.00	.	0.00	0	4.9100	4.9000	9.8000	2.8500
	POTASSIUM	5	0.00	.	0.00	0	13126.0000	14100.0000	15000.0000	2100.0000

Table 3: Dissolved Metals
(Eighth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B3	SELENIUM	5	100.00	.	0.00	0	1.1400	0.7333	2.6667	0.7333
	SILICON	6	0.00	.	0.00	0	4330.0000	4535.0000	4710.0000	550.0000
	SILVER	5	100.00	.	0.00	0	2.3800	2.5000	3.7500	2.1500
	SODIUM	5	0.00	.	0.00	0	30220.0000	31000.0000	36000.0000	6400.0000
	STRONTIUM	5	0.00	.	0.00	0	168.6000	156.0000	230.0000	19.0000
	THALLIUM	4	100.00	.	0.00	0	0.6750	0.6500	0.9333	0.3833
	TIN	5	100.00	.	0.00	0	10.1900	7.4000	19.4500	5.6000
	VANADIUM	5	60.00	.	0.00	0	4.6500	3.8000	9.0000	2.0500
	ZINC	5	20.00	.	0.00	0	45.4600	55.8000	58.9000	7.0000
B4/B5	ALUMINUM	53	54.72	87	7.55	0	35.9255	20.9091	61.0000	24.0000
	ANTIMONY	56	92.86	.	0.00	0	11.4437	9.0288	21.1000	11.2806
	ARSENIC	54	81.48	.	0.00	0	1.4139	1.2707	2.6667	1.2621
	BARIUM	53	3.77	.	0.00	0	63.7689	62.0000	83.0000	12.4000
	BERYLLIUM	54	96.30	.	0.00	0	0.5598	0.4896	0.8542	0.5208
	CADMIUM	45	95.56	.	0.00	0	1.5067	1.3846	2.4375	1.2933
	CALCIUM	54	0.00	.	0.00	0	41521.2963	41050.0000	46600.0000	6800.0000
	CESIUM	48	85.42	.	0.00	2	90.4935	45.3125	200.0000	63.3000
	CHROMIUM	54	94.44	.	0.00	0	2.4296	1.9412	4.6667	2.4412
	COBALT	54	87.04	.	0.00	1	2.6396	2.0000	5.0000	2.1333
	COPPER	54	59.26	.	0.00	0	5.0167	3.4667	8.9000	4.9333

Table 3: Dissolved Metals
(Ninth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B4/B5	IRON	53	60.38	300	0.00	0	21.4396	11.5000	37.7000	20.8000
	LEAD	54	61.11	.	0.00	0	1.3537	0.9423	2.1500	1.3000
	LITHIUM	43	23.26	.	0.00	3	13.6313	8.9500	22.7000	8.1000
	MAGNESIUM	54	0.00	.	0.00	0	8693.7963	8485.0000	9380.0000	1090.0000
	MANGANESE	54	12.96	50	27.78	0	45.2954	15.4500	110.0000	58.4000
	MERCURY	53	96.23	.	0.00	0	0.1047	0.1020	0.1765	0.1020
	MOLYBDENUM	43	51.16	.	0.00	3	12.7200	6.4500	13.2667	6.2750
	NICKEL	54	92.59	.	0.00	0	4.9694	3.7500	9.0000	4.0000
	POTASSIUM	54	1.85	.	0.00	0	9559.0741	9525.0000	11400.0000	2550.0000
	SELENIUM	54	90.74	.	0.00	0	1.4806	1.0819	2.5000	1.2639
	SILICON	9	0.00	.	0.00	0	3910.0000	4150.0000	4320.0000	740.0000
	SILVER	54	98.15	.	0.00	0	1.8204	1.5817	3.3000	1.7917
	SODIUM	54	0.00	.	0.00	0	32759.2593	32600.0000	37200.0000	6000.0000
	STRONTIUM	42	9.52	.	0.00	0	243.5476	230.0000	268.0000	40.0000
	THALLIUM	53	96.23	.	0.00	0	2.2132	0.9000	4.2857	1.5929
	TIN	43	83.72	.	0.00	3	27.3813	9.0476	22.5250	7.7583
	VANADIUM	54	51.85	.	0.00	1	3.4698	3.5000	5.4000	2.5455
	ZINC	53	15.09	.	0.00	0	27.6302	23.8000	44.2000	18.5000

Table 3: Dissolved Metals
(Tenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C1	ALUMINUM	4	100.00	87	0.00	0	33.7250	28.9500	72.0000	40.5500
	ANTIMONY	5	80.00	.	0.00	0	12.9400	11.0000	21.1000	8.5333
	ARSENIC	4	100.00	.	0.00	0	0.9750	0.8000	2.0000	1.0500
	BARIUM	5	0.00	.	0.00	0	85.8000	88.6000	110.0000	12.6000
	BERYLLIUM	5	100.00	.	0.00	0	0.3600	0.3333	0.6667	0.0333
	CADMIUM	3	100.00	.	0.00	0	1.7667	1.6500	2.3000	0.9500
	CALCIUM	5	0.00	.	0.00	0	46120.0000	47200.0000	48800.0000	3400.0000
	CESIUM	5	80.00	.	0.00	0	173.0000	125.0000	375.0000	160.0000
	CHROMIUM	5	100.00	.	0.00	0	1.7700	1.3667	2.7500	1.4000
	COBALT	5	100.00	.	0.00	0	1.8500	1.3333	3.6500	1.2000
	COPPER	5	60.00	.	0.00	0	4.4500	2.7000	9.7000	4.1500
	IRON	5	40.00	300	0.00	0	35.5300	36.0000	67.0000	24.7000
	LEAD	5	60.00	.	0.00	0	1.0100	0.7000	1.8000	1.1000
	LITHIUM	5	20.00	.	0.00	0	6.4700	6.8000	10.2000	2.2000
	MAGNESIUM	5	0.00	.	0.00	0	9284.0000	9400.0000	10200.0000	1490.0000
	MANGANESE	5	0.00	50	80.00	0	77.0400	92.0000	114.0000	41.2000
	MERCURY	5	100.00	.	0.00	0	0.1000	0.1000	0.1667	0.0667
	MOLYBDENUM	5	100.00	.	0.00	0	2.8400	2.0000	5.0000	1.9000
	NICKEL	5	100.00	.	0.00	0	3.8300	2.5000	7.3500	3.3500
	POTASSIUM	5	40.00	.	0.00	0	1522.0000	1600.0000	2100.0000	493.3333

Table 3: Dissolved Metals
(Eleventh of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C1	SELENIUM	5	80.00	.	0.00	0	1.2700	1.2000	2.6667	0.7333
	SILICON	7	0.00	.	0.00	0	6058.5714	6270.0000	6810.0000	1450.0000
	SILVER	5	100.00	.	0.00	0	2.3800	2.5000	3.7500	2.1500
	SODIUM	5	0.00	.	0.00	0	23420.0000	24000.0000	27000.0000	6000.0000
	STRONTIUM	5	0.00	.	0.00	0	245.6000	250.0000	270.0000	15.0000
	THALLIUM	4	100.00	.	0.00	0	0.6750	0.6500	0.9333	0.3833
	TIN	5	100.00	.	0.00	0	9.2500	6.5000	19.4500	4.3667
	VANADIUM	5	100.00	.	0.00	0	2.1900	1.9000	3.8000	1.9167
	ZINC	5	80.00	.	0.00	0	3.6200	2.5000	9.6000	2.1000
C2	ALUMINUM	51	52.94	87	1.96	0	35.2284	17.0500	35.5000	22.6000
	ANTIMONY	52	84.62	.	0.00	0	12.4058	10.0500	22.2727	11.7045
	ARSENIC	52	53.85	.	0.00	0	2.0817	2.0000	3.5000	1.9500
	BARIUM	52	1.92	.	0.00	0	72.5135	72.1000	87.1000	16.2000
	BERYLLIUM	52	100.00	.	0.00	0	0.5500	0.5100	0.8800	0.5000
	CADMIUM	46	97.83	.	0.00	0	1.5033	1.3810	2.5000	1.2857
	CALCIUM	52	0.00	.	0.00	0	41379.8077	40000.0000	54000.0000	15350.0000
	CESIUM	44	81.82	.	0.00	2	77.1476	39.7368	166.6667	58.9474
	CHROMIUM	52	96.15	.	0.00	0	2.3856	1.8831	4.3750	2.3030
	COBALT	52	100.00	.	0.00	1	2.2784	1.7333	4.0000	2.0000
	COPPER	52	55.77	.	0.00	0	6.5519	3.6667	12.5000	7.0667

Table 3: Dissolved Metals
(Twelfth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C2	IRON	51	60.78	300	0.00	0	21.0147	5.7333	50.0000	27.6000
	LEAD	52	69.23	.	0.00	0	1.1269	0.8448	2.0000	1.2690
	LITHIUM	39	23.08	.	0.00	2	12.2500	10.0000	13.0000	3.4000
	MAGNESIUM	52	0.00	.	0.00	0	14909.6154	14850.0000	16900.0000	2250.0000
	MANGANESE	52	9.62	50	51.92	0	120.0654	57.5000	193.0000	149.2500
	MERCURY	50	92.00	.	0.00	0	0.1198	0.1089	0.1867	0.1111
	MOLYBDENUM	39	82.05	.	0.00	2	7.4784	4.4000	14.4444	6.7000
	NICKEL	52	96.15	.	0.00	0	4.9856	3.0909	10.0000	4.7159
	POTASSIUM	52	1.92	.	0.00	0	6217.0192	6220.0000	7180.0000	1122.5000
	SELENIUM	51	90.20	.	0.00	0	1.5304	1.1111	2.7368	1.2697
	SILICON	4	0.00	.	0.00	0	949.0000	811.0000	1370.0000	286.0000
	SILVER	52	98.08	.	0.00	0	1.7769	1.5625	3.2000	1.6775
	SODIUM	52	0.00	.	0.00	0	51372.1154	52100.0000	59400.0000	11500.0000
	STRONTIUM	41	7.32	.	0.00	0	338.5976	331.0000	402.0000	56.0000
	THALLIUM	52	96.15	.	0.00	0	2.5894	1.1000	6.0000	2.5952
	TIN	39	82.05	.	0.00	2	13.7797	10.0000	23.9000	8.8889
	VANADIUM	52	78.85	.	0.00	1	2.2588	2.0000	4.0000	2.5000
	ZINC	51	56.86	.	0.00	0	11.9275	3.1333	14.1000	7.2333

Table 3: Dissolved Metals
(Thirteenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
LANDFILL	ALUMINUM	16	87.50	87	0.00	0	40.2062	20.9250	73.8000	46.7500
	ANTIMONY	16	87.50	.	0.00	1	18.9833	15.0000	30.0000	17.1333
	ARSENIC	14	64.29	.	0.00	0	2.2643	1.5000	4.6000	1.7667
	BARIUM	16	0.00	.	0.00	0	560.3750	570.0000	641.0000	84.0000
	BERYLLIUM	14	92.86	.	0.00	0	1.2679	0.5250	2.5000	0.9167
	CADMIUM	16	93.75	.	0.00	1	2.0633	1.6500	3.3333	1.7167
	CALCIUM	16	0.00	.	0.00	0	148125.000	141500.000	163000.000	22500.000
	CESIUM	16	93.75	.	0.00	5	167.1364	100.0000	357.1429	214.2857
	CHROMIUM	16	93.75	.	0.00	0	5.6000	2.8250	10.2500	7.3333
	COBALT	16	62.50	.	0.00	3	5.3808	4.7000	12.6000	4.2333
	COPPER	16	87.50	.	0.00	0	5.3375	3.6500	10.0000	5.2917
	IRON	16	0.00	300	100.00	0	68293.7500	69200.0000	78600.0000	13000.0000
	LEAD	16	75.00	.	0.00	0	2.5812	0.8417	3.8000	1.8917
	LITHIUM	16	25.00	.	0.00	0	45.8844	36.9500	75.0000	11.5000
	MAGNESIUM	16	0.00	.	0.00	0	34400.0000	32750.0000	40600.0000	7650.0000
	MANGANESE	16	0.00	50	100.00	0	1568.7500	1500.0000	1740.0000	300.0000
	MERCURY	16	100.00	.	0.00	0	0.0969	0.0938	0.1625	0.0938
	MOLYBDENUM	16	87.50	.	0.00	1	17.0600	6.5000	40.0000	17.1500
	NICKEL	16	81.25	.	0.00	0	10.2125	7.2417	16.7000	9.6917
	POTASSIUM	16	12.50	.	0.00	0	5575.0000	5835.0000	6370.0000	1235.0000

Table 3: Dissolved Metals
(Fourteenth of fourteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non-Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
LANDFILL	SELENIUM	15	100.00	.	0.00	1	1.3571	1.1000	2.5000	0.8500
	SILICON	11	0.00	.	0.00	0	10000.0000	10300.0000	10900.0000	1230.0000
	SILVER	16	93.75	.	0.00	1	3.6833	2.5000	5.0000	2.8667
	SODIUM	16	0.00	.	0.00	0	71400.0000	67200.0000	83600.0000	15500.0000
	STRONTIUM	16	6.25	.	0.00	0	927.1875	924.0000	1130.0000	181.0000
	THALLIUM	16	100,00	.	0.00	0	1.8094	1.1667	2.5000	1.2917
	TIN	16	68.75	.	0.00	0	85.4844	25.3667	183.0000	55.5167
	VANADIUM	16	68.75	.	0.00	3	5.6115	3.5000	9.5500	3.9667
	ZINC	16	0.00	.	0.00	0	1637.4375	1590.0000	2260.0000	785.0000

Table 4: Water Quality Parameters
(First of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
BACKGROUND	BICARBONATE	55	0.00	.	0.00	0	89.9073	86.0000	130.0000	54.0000
	BICARBONATE AS CACO3	73	0.00	.	0.00	0	89.4890	90.0000	115.0000	30.0000
	CARBONATE	58	98.28	.	0.00	0	2.6466	2.5000	4.4118	2.7451
	CARBONATE AS CACO3	70	70.00	.	0.00	20	4.8700	4.4318	8.4091	5.6818
	CHLORIDE	127	6.30	250000	0.00	0	17.0756	12.0000	29.0000	16.4000
	CYANIDE	106	97.17	5	0.00	0	0.0061	0.0048	0.0098	0.0085
	DISSOLVED ORGANIC CARBON	9	0.00	.	0.00	0	5.7778	5.0000	8.0000	3.0000
	FLUORIDE	76	7.89	2000	0.00	0	0.3393	0.3200	0.4300	0.0950
	NITRATE	2	50.00	10000	0.00	0	0.1500	0.1500	0.2500	0.2000
	NITRATE/NITRITE	125	42.40	10000	0.00	0	0.3893	0.1000	0.8700	0.5079
	NITRITE	75	96.00	500	0.00	0	0.0116	0.0100	0.0179	0.0108
	OIL AND GREASE	80	73.75	.	0.00	0	2.9937	2.6750	4.7000	3.1583
	ORTHOPHOSPHATE	67	94.03	.	0.00	0	0.0211	0.0170	0.0404	0.0277
	PHOSPHORUS	76	61.84	.	0.00	0	0.0372	0.0262	0.0600	0.0317
	SILICA	24	8.33	.	0.00	0	8.0171	4.7000	12.0000	7.9000
	SULFATE	127	1.57	250000	0.00	0	19.3929	17.8000	27.0000	12.0000
	SULFIDE	55	89.09	2	9.09	5	0.7800	0.5667	0.9556	0.5556
	TOTAL DISSOLVED SOLIDS	125	0.00	.	0.00	0	174.168	180.000	212.0000	50.0000
	TOTAL ORGANIC CARBON	19	0.00	.	0.00	0	6.5737	6.0000	11.3000	5.1000
	TOTAL SUSPENDED SOLIDS	132	37.12	.	0.00	0	21.1174	7.0000	26.0000	12.0455

Table 4: Water Quality Parameters
(Second of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A1/A2	AMMONIA	10	10.00	60	0.00	0	0.4850	0.3850	0.5200	0.2200
	BICARBONATE AS CACO3	14	0.00	.	0.00	0	183.057	194.500	253.0000	59.0000
	CARBONATE AS CACO3	14	7.14	.	0.00	0	75.3714	75.4500	85.8000	41.4000
	CHLORIDE	14	0.00	250000	0.00	0	129.143	127.500	142.0000	16.0000
	CYANIDE	14	100.00	5	0.00	0	0.0061	0.0054	0.0092	0.0050
	DISSOLVED ORGANIC CARBON	6	0.00	.	0.00	0	16.1667	16.5000	17.0000	2.0000
	FLUORIDE	12	0.00	2000	0.00	0	2.8833	2.7500	3.6000	0.4500
	HEXAVALENT CHROMIUM	8	100.00	11	0.00	0	0.0094	0.0088	0.0150	0.0088
	NITRATE/NITRITE	14	57.14	10000	0.00	0	0.1029	0.0833	0.1600	0.0756
	NITRITE	14	92.86	500	0.00	0	0.0114	0.0107	0.0171	0.0100
	OIL AND GREASE	14	78.57	.	0.00	0	3.9000	3.0500	6.1000	1.2500
	ORTHOPHOSPHATE	14	64.29	.	0.00	0	0.0460	0.0375	0.0850	0.0640
	PHOSPHORUS	14	21.43	.	0.00	0	0.0825	0.0745	0.1200	0.0700
	SULFATE	14	0.00	250000	0.00	0	163.0786	153.5000	212.0000	116.0000
	SULFIDE	14	100.00	2	0.00	0	0.5000	0.5000	0.8000	0.4667
	TOTAL DISSOLVED SOLIDS	14	0.00	.	0.00	0	703.8571	694.0000	782.0000	68.0000
	TOTAL ORGANIC CARBON	6	0.00	.	0.00	0	19.1667	19.5000	21.0000	2.0000
	TOTAL SUSPENDED SOLIDS	14	28.57	.	0.00	0	8.7143	7.0000	14.0000	8.0000

Table 4: Water Quality Parameters
(Third of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	ALKALINITY AS CACO3	1	100.00	.	0.00	0	5.0000	5.0000	5.0000	0.0000
	AMMONIA	95	15.79	60	0.00	0	2.5453	1.3000	5.5000	3.6800
	BICARBONATE	25	0.00	.	0.00	0	106.7600	106.0000	125.0000	30.0000
	BICARBONATE AS CACO3	31	3.23	.	0.00	0	104.4774	112.0000	135.0000	40.0000
	CARBONATE AS CACO3	35	97.14	.	0.00	0	5.5429	4.6875	8.4375	5.0000
	CHLORIDE	53	0.00	250000	0.00	0	49.5264	46.0000	61.0000	18.0000
	CYANIDE	13	92.31	5	0.00	0	2.8731	0.0150	10.0000	5.5607
	DISSOLVED ORGANIC CARBON	3	0.00	.	0.00	0	5.0000	5.0000	6.0000	2.0000
	FLUORIDE	55	43.64	2000	0.00	0	0.4077	0.4400	0.6000	0.2200
	HEXAVALENT CHROMIUM	30	100.00	11	0.00	1	0.0053	0.0054	0.0086	0.0046
	HYDROGEN SULFIDE	1	100.00	.	0.00	0	0.5000	0.5000	0.5000	0.0000
	NITRATE	4	0.00	10000	0.00	0	110.7000	4.9000	430.0000	214.6000
	NITRATE/NITRITE	107	0.93	10000	0.00	0	2.9416	3.2000	4.2000	2.1000
	NITRITE	55	7.27	500	0.00	0	0.1247	0.0700	0.1800	0.1000
	OIL AND GREASE	17	82.35	.	0.00	0	5.1588	3.0500	6.3000	2.0000
	ORTHOPHOSPHATE	44	70.45	.	0.00	0	0.0315	0.0172	0.0600	0.0341
	PHOSPHATE	31	54.84	.	0.00	0	0.0355	0.0200	0.0660	0.0513
	PHOSPHORUS	16	50.00	.	0.00	0	0.0669	0.0417	0.1000	0.0700

Table 4: Water Quality Parameters
(Fourth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
A3/A4	SILICON	10	0.00	.	0.00	0	4.0200	4.0000	4.2000	0.0000
	SULFATE	53	0.00	250000	0.00	0	57.2660	54.0000	68.0000	20.0000
	SULFIDE	9	100.00	2	0.00	0	0.5000	0.5000	0.8000	0.4000
	TOTAL ALKALINITY	46	2.17	.	0.00	0	104.0326	105.0000	125.0000	35.0000
	TOTAL DISSOLVED SOLIDS	55	0.00	.	0.00	0	320.5091	300.0000	350.0000	80.0000
	TOTAL ORGANIC CARBON	3	0.00	.	0.00	0	6.6667	7.0000	8.0000	3.0000
	TOTAL SUSPENDED SOLIDS	383	46.48	.	0.00	0	8.5561	4.6094	16.0000	9.0469
B1/B2	AMMONIA	10	0.00	60	0.00	0	0.7100	0.4050	0.7800	0.3400
	BICARBONATE AS CACO3	14	0.00	.	0.00	0	96.7786	89.8000	148.0000	76.5000
	CARBONATE AS CACO3	14	21.43	.	0.00	0	63.1786	58.0000	106.0000	87.7000
	CHLORIDE	14	0.00	250000	0.00	0	76.4500	81.2500	88.6000	15.9000
	CYANIDE	14	100.00	5	0.00	0	0.0075	0.0069	0.0125	0.0063
	DISSOLVED ORGANIC CARBON	6	0.00	.	0.00	0	13.3333	14.0000	16.0000	3.0000
	FLUORIDE	14	0.00	2000	0.00	0	0.9750	1.0000	1.1000	0.1800
	HEXAVALENT CHROMIUM	8	100.00	11	0.00	0	0.0100	0.0100	0.0158	0.0089
	HYDROGEN SULFIDE	2	100.00	.	0.00	0	0.5000	0.5000	0.6667	0.3333
	NITRATE/NITRITE	14	85.71	10000	0.00	0	0.0771	0.0577	0.0923	0.0538
	NITRITE	14	85.71	500	0.00	0	0.0164	0.0115	0.0185	0.0108

Table 4: Water Quality Parameters
(Fifth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B1/B2	OIL AND GREASE	14	92.86	.	0.00	0	3.2821	2.8750	3.3600	0.6000
	ORTHOPHOSPHATE	14	57.14	.	0.00	0	0.0589	0.0417	0.1000	0.0598
	PHOSPHATE	2	0.00	.	0.00	0	0.1415	0.1415	0.1900	0.0970
	PHOSPHORUS	14	14.29	.	0.00	0	0.1120	0.1085	0.1700	0.0830
	SODIUM SULFATE	2	0.00	.	0.00	0	23.7000	23.7000	28.7000	10.0000
	SULFATE	14	0.00	250000	0.00	0	21.9786	21.4000	30.9000	14.1000
	SULFIDE	14	100.00	2	0.00	0	0.5000	0.5000	0.8000	0.4667
	TOTAL DISSOLVED SOLIDS	14	0.00	.	0.00	0	336.2857	319.0000	374.0000	92.0000
	TOTAL ORGANIC CARBON	6	0.00	.	0.00	0	16.8333	16.5000	22.0000	7.0000
	TOTAL SUSPENDED SOLIDS	14	50.00	.	0.00	0	6.5357	5.1875	13.0000	6.5000
B3	AMMONIA	3	0.00	60	0.00	0	15.3333	19.3000	23.0000	19.3000
	BICARBONATE AS CACO3	6	0.00	.	0.00	0	100.6167	111.0000	142.0000	40.3000
	CARBONATE AS CACO3	6	100.00	.	0.00	0	5.0000	5.0000	8.5714	4.2857
	CHLORIDE	6	0.00	250000	0.00	0	55.9500	59.2000	64.6000	6.3000
	CYANIDE	6	100.00	5	0.00	0	0.0050	0.0050	0.0086	0.0043
	DISSOLVED ORGANIC CARBON	3	0.00	.	0.00	0	7.3333	8.0000	9.0000	4.0000
	FLUORIDE	6	0.00	2000	0.00	0	0.3467	0.3350	0.4200	0.0900
	HEXAVALENT CHROMIUM	3	100.00	11	0.00	0	0.0100	0.0100	0.0150	0.0100
	HYDROGEN SULFIDE	1	100.00	.	0.00	0	0.5000	0.5000	0.5000	0.0000
	NITRATE/NITRITE	5	0.00	10000	0.00	0	7.3200	8.7000	9.6000	1.9000
	NITRITE	4	0.00	500	0.00	0	0.6363	0.5450	1.4000	0.7475

Table 4: Water Quality Parameters
(Sixth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B3	OIL AND GREASE	6	83.33	.	0.00	0	5.1750	3.0750	17.2000	0.8000
	ORTHOPHOSPHATE	6	0.00	.	0.00	0	0.2750	0.2850	0.3500	0.1000
	PHOSPHATE	1	0.00	.	0.00	0	0.2800	0.2800	0.2800	0.0000
	PHOSPHORUS	6	16.67	.	0.00	0	0.3075	0.3100	0.5100	0.1900
	SODIUM SULFATE	1	0.00	.	0.00	0	67.5000	67.5000	67.5000	0.0000
	SULFATE	6	0.00	250000	0.00	0	77.1500	75.0500	96.6000	17.0000
	SULFIDE	6	100.00	2	0.00	0	0.5000	0.5000	0.8571	0.4286
	TOTAL DISSOLVED SOLIDS	6	0.00	.	0.00	0	282.3333	285.0000	314.0000	44.0000
	TOTAL ORGANIC CARBON	3	0.00	.	0.00	0	13.0000	12.0000	19.0000	11.0000
	TOTAL SUSPENDED SOLIDS	6	66.67	.	0.00	0	3.5000	3.5000	6.0000	3.0000
B4/B5	2,3,7,8-TCDD	6	100.00	.	0.00	0	0.5675	0.5375	1.0500	0.4900
	AMMONIA	85	3.53	60	0.00	0	6.8512	5.9000	11.1000	6.0000
	BICARBONATE	36	0.00	.	0.00	0	109.2500	106.5000	135.0000	24.5000
	BICARBONATE AS CACO3	38	2.63	.	0.00	0	96.2789	97.5000	120.0000	31.6000
	CARBONATE AS CACO3	46	100.00	.	0.00	0	4.7935	4.6591	8.4091	5.0000
	CHLORIDE	67	0.00	250000	0.00	0	48.0313	43.0000	62.0000	20.0000
	CYANIDE	16	68.75	5	31.25	0	9.3591	3.7500	29.4000	14.7433
	DISSOLVED ORGANIC CARBON	17	0.00	.	0.00	0	6.2353	6.0000	7.0000	1.0000
	FLUORIDE	68	47.06	2000	0.00	0	0.3956	0.4297	0.6000	0.2972
	HEXAVALENT CHROMIUM	51	98.04	11	0.00	0	0.0055	0.0053	0.0089	0.0052

Table 4: Water Quality Parameters
(Seventh of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
B4/B5	HYDROGEN SULFIDE	1	100.00	.	0.00	0	0.5000	0.5000	0.5000	0.0000
	NITRATE	3	0.00	10000	0.00	0	2.7667	2.6000	3.2000	0.7000
	NITRATE/NITRITE	94	3.19	10000	0.00	0	3.3593	3.2000	4.3000	1.4000
	NITRITE	64	0.00	500	0.00	0	0.4095	0.3350	0.6800	0.3800
	OIL AND GREASE	30	83.33	.	0.00	0	4.1817	2.7974	5.4000	2.2105
	ORTHOPHOSPHATE	45	17.78	.	0.00	0	0.0941	0.0800	0.1600	0.0967
	PHOSPHATE	42	42.86	.	0.00	0	0.1207	0.0350	0.2900	0.1642
	PHOSPHORUS	30	6.67	.	0.00	0	0.1773	0.1700	0.2600	0.1300
	SILICA, DISSOLVED	2	0.00	.	0.00	0	6.2000	6.2000	9.0000	5.6000
	SILICON	14	0.00	.	0.00	0	4.2857	4.0000	5.0000	1.0000
	SODIUM SULFATE	1	0.00	.	0.00	0	69.9000	69.9000	69.9000	0.0000
	SULFATE	66	0.00	250000	0.00	0	58.3333	58.5000	74.0000	24.0000
	SULFIDE	20	95.00	2	0.00	0	0.5300	0.5526	0.8684	0.4737
	TOTAL ALKALINITY	60	0.00	.	0.00	0	105.8750	102.0000	133.5000	22.5000
	TOTAL DISSOLVED SOLIDS	70	0.00	.	0.00	0	348.0429	279.0000	340.0000	80.0000
	TOTAL ORGANIC CARBON	17	0.00	.	0.00	0	8.4118	8.0000	10.0000	1.0000
	TOTAL SUSPENDED SOLIDS	242	13.64	.	0.00	0	16.4649	11.2500	30.0000	15.0000

Table 4: Water Quality Parameters
(Eighth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C1	ALKALINITY AS CACO3	1	0.00	.	0.00	0	165.0000	165.0000	165.0000	0.0000
	AMMONIA	7	28.57	60	0.00	0	0.3186	0.2600	0.4100	0.2767
	BICARBONATE	1	0.00	.	0.00	0	165.0000	165.0000	165.0000	0.0000
	BICARBONATE AS CACO3	6	0.00	.	0.00	0	141.0167	153.0000	194.0000	44.0000
	CARBONATE AS CACO3	7	85.71	.	0.00	0	6.2143	5.7143	8.5714	5.7143
	CHLORIDE	7	0.00	250000	0.00	0	24.9000	24.6000	29.3000	8.7000
	CYANIDE	7	100.00	5	0.00	0	0.0071	0.0060	0.0100	0.0060
	DISSOLVED ORGANIC CARBON	4	0.00	.	0.00	0	5.5000	5.5000	7.0000	2.0000
	FLUORIDE	7	0.00	2000	0.00	0	0.4529	0.4500	0.4900	0.0700
	HEXAVALENT CHROMIUM	4	100.00	11	0.00	0	0.0088	0.0075	0.0150	0.0075
	NITRATE/NITRITE	7	100.00	10000	0.00	0	0.0500	0.0500	0.0750	0.0500
	NITRITE	7	100.00	500	0.00	0	0.0100	0.0100	0.0150	0.0100
	OIL AND GREASE	7	85.71	.	0.00	0	3.4714	3.0500	3.3000	0.6500
	ORTHOPHOSPHATE	7	85.71	.	0.00	0	0.0294	0.0286	0.0429	0.0286
	PHOSPHORUS	6	50.00	.	0.00	0	0.0388	0.0438	0.0540	0.0290
	SULFATE	7	0.00	250000	0.00	0	17.9286	15.8000	23.6000	10.1000
	SULFIDE	7	85.71	2	0.00	0	0.4829	0.5000	0.6667	0.3867
	TOTAL DISSOLVED SOLIDS	7	0.00	.	0.00	0	240.2857	256.0000	256.0000	36.0000
	TOTAL ORGANIC CARBON	4	0.00	.	0.00	0	8.2500	7.5000	12.0000	4.5000
	TOTAL SUSPENDED SOLIDS	7	14.29	.	0.00	0	15.5000	18.0000	18.0000	8.0000

Table 4: Water Quality Parameters
(Ninth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
C2	2,3,7,8-TCDD	6	100.00	.	0.00	0	2.1658	0.7500	6.5000	4.2100
	AMMONIA	61	39.34	60	0.00	0	1.2052	0.4474	2.8000	1.2158
	BICARBONATE	37	0.00	.	0.00	0	173.7297	168.0000	205.0000	38.0000
	BICARBONATE AS CACO3	27	3.70	.	0.00	0	141.3293	140.0000	180.0000	46.0000
	CARBONATE AS CACO3	40	100.00	.	0.00	0	4.7625	4.6053	8.2895	5.0000
	CHLORIDE	59	0.00	250000	0.00	0	49.5593	50.0000	56.0000	9.0000
	CYANIDE	10	100.00	5	0.00	0	5.1750	5.0000	8.8889	5.5556
	DISSOLVED ORGANIC CARBON	13	0.00	.	0.00	0	8.1538	8.0000	10.0000	2.0000
	FLUORIDE	58	3.45	2000	0.00	0	0.6517	0.6000	0.8000	0.1000
	HEXAVALENT CHROMIUM	45	97.78	11	0.00	0	0.0057	0.0052	0.0089	0.0050
	NITRATE	3	0.00	10000	0.00	0	104.4000	1.9000	310.0000	308.7000
	NITRATE/NITRITE	64	71.88	10000	0.00	0	0.2347	0.0638	0.3400	0.0713
	NITRITE	51	94.12	500	0.00	0	0.0075	0.0059	0.0100	0.0059
	OIL AND GREASE	21	61.90	.	0.00	0	6.2524	3.9286	12.0000	5.9571
	ORTHOPHOSPHATE	29	51.72	.	0.00	0	0.0354	0.0200	0.0850	0.0438
	PHOSPHATE	34	47.06	.	0.00	0	0.0404	0.0100	0.1100	0.0747
	PHOSPHORUS	20	5.00	.	0.00	0	0.1308	0.0900	0.1900	0.1100
	SILICA, DISSOLVED	3	0.00	.	0.00	0	6.2000	6.0000	9.0000	5.4000
	SILICON	11	54.55	.	0.00	0	1.9091	1.7143	4.0000	2.1429

Table 4: Water Quality Parameters
(Twelfth of thirteen pages)

Pond	Analyte	Sample Size	Percent Non-Detect	CWQCC Standard	Percent Above Standard	Number of Non_Detects Omitted	Mean	Median	85th Percentile	Inter-Quartile Range
LANDFILL	HEPTACHLOR	1	100.00	.	0.00	0	0.0000	0.0000	0.0000	0.0000
	HEPTACHLOR EPOXIDE	2	100.00	.	0.00	0	0.0000	0.0000	0.0000	0.0000
	METHOXYCHLOR	2	100.00	.	0.00	0	0.0003	0.0003	0.0003	0.0000
	NITRATE	1	100.00	10000	0.00	0	0.0500	0.0500	0.0500	0.0000
	NITRATE/NITRITE	16	50.00	10000	0.00	0	0.1856	0.0950	0.5100	0.1700
	NITRITE	12	50.00	500	0.00	0	0.0294	0.0280	0.0500	0.0295
	OIL AND GREASE	18	61.11	.	0.00	0	4.9417	2.0333	4.1333	2.9500
	ORTHOPHOSPHATE	8	87.50	.	0.00	0	0.0318	0.0250	0.0429	0.0286
	PHOSPHATE	5	20.00	.	0.00	0	0.0960	0.1000	0.1500	0.0100
	PHOSPHORUS	14	14.29	.	0.00	0	0.3308	0.1100	0.5900	0.2215
	SILICA, DISSOLVED	3	0.00	.	0.00	0	19.5667	8.3000	43.0000	35.6000
	SULFATE	16	75.00	250000	0.00	0	6.0469	2.5000	13.8000	8.7083
	SULFIDE	8	100.00	2	0.00	1	0.5000	0.5000	0.7500	0.5000
	TOTAL DISSOLVED SOLIDS	17	0.00	.	0.00	0	772.7059	760.0000	940.0000	142.0000
	TOTAL ORGANIC CARBON	4	0.00	.	0.00	0	21.7000	21.6500	24.5000	5.4000
	TOTAL SUSPENDED SOLIDS	16	0.00	.	0.00	0	400.5625	126.0000	750.0000	152.5000
	TOXAPHENE	2	100.00	.	0.00	0	0.0005	0.0005	0.0007	0.0003

Table 5 POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

(First of six pages)

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
A1-A2	CLP Volatiles (1)	ACETONE	.	10	10	0	6.55
	CLP Semi-Volatiles (2)	BIS(2-ETHYLHEXYL)PHTHALATE	1.8	12	8.33	1	22.875
	Selected Compounds-EPA 502.2 (9)	1,2,3-TRICHLOROBENZENE	.	11	9.09	0	0.0555
	Selected Compounds-EPA 502.2 (9)	1,2,4-TRICHLOROBENZENE	.	12	8.33	0	0.0558
	Selected Compounds-EPA 502.2 (9)	BENZENE, 1,2,4-TRIMETHYL	.	11	9.09	0	0.0564
	Selected Compounds-EPA 502.2 (9)	HEXACHLOROBUTADIENE	0.45	12	8.33	0	0.07
	Selected Compounds-EPA 502.2 (9)	NAPHTHALENE	0.0028	12	8.33	1	0.1483
	Selected Compounds-EPA 502.2 (9)	TETRACHLOROETHENE	0.8	12	16.67	0	0.0792
	Selected Compounds-EPA 502.2 (9)	TRICHLOROETHENE	66	12	16.67	0	0.0817
	Selected Compounds-EPA 502.2 (9)	cis-1,3-DICHLOROPROPENE	10	12	8.33	0	0.08
	Selected Compounds-EPA 502.2 (9)	n-BUTYLBENZENE	.	11	9.09	0	0.1491
	Tri-Pesticides-EPA 619 (15)	ATRAZINE	3	12	83.33	0	1.0458

Table 5 POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

(Second of six pages)

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
A3-A4	CLP Volatiles (1)	1,1-DICHLOROETHENE	0.057	132	0.76	1	2.6098
	CLP Volatiles (1)	METHYLENE CHLORIDE	4.7	132	6.82	9	2.9621
	CLP Volatiles (1)	TETRACHLOROETHENE	0.8	132	1.52	2	2.6212
	CLP Semi-Volatiles (2)	BIS(2-ETHYLHEXYL)PHTHALATE	1.8	33	6.06	2	5.4091
	Selected Compounds-EPA 502.2 (9)	1,1,1-TRICHLOROETHANE	200	16	6.25	0	0.0888
	Selected Compounds-EPA 502.2 (9)	1,1-DICHLOROETHENE	0.057	16	6.25	1	0.1381
	Selected Compounds-EPA 502.2 (9)	TETRACHLOROETHENE	0.8	16	6.25	0	0.08
	Herbicides-EPA 615 (11)	DICAMBA	.	12	58.33	0	0.83
	Herbicides-EPA 615 (11)	DICHLOROPROP	.	12	8.33	0	0.475
	Tri-Pesticides-EPA 619 (15)	ATRAZINE	3	76	59.21	5	0.7281
	Tri-Pesticides-EPA 619 (15)	SIMAZINE	4	64	12.5	0	0.1563

Table 5 POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

(Third of six pages)

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
B1-B2	CLP Volatiles (1)	1,2-DICHLOROETHENE	.	16	6.25	0	2.9063
	CLP Volatiles (1)	ACETONE	.	13	30.77	0	37.0385
	CLP Volatiles (1)	METHYLENE CHLORIDE	4.7	16	12.5	2	4.875
	CLP Volatiles (1)	TRICHLOROETHENE	66	16	31.25	0	4.375
	CLP Volatiles (1)	cis-1,2-DICHLOROETHENE	70	1	100	0	3.3
	Selected Compounds-EPA 502.2 (9)	1,2,4-TRICHLOROBENZENE	.	12	8.33	0	0.0567
	Selected Compounds-EPA 502.2 (9)	CARBON TETRACHLORIDE	18	12	16.67	0	0.3083
	Selected Compounds-EPA 502.2 (9)	CHLOROFORM	6	12	58.33	0	0.2158
	Selected Compounds-EPA 502.2 (9)	NAPHTHALENE	0.0028	12	8.33	1	0.12
	Selected Compounds-EPA 502.2 (9)	TETRACHLOROETHENE	0.8	12	58.33	1	0.2133
	Selected Compounds-EPA 502.2 (9)	TOLUENE	1000	12	8.33	0	0.1333
	Selected Compounds-EPA 502.2 (9)	TRICHLOROETHENE	66	12	50	0	3.0775
	Selected Compounds-EPA 502.2 (9)	VINYL CHLORIDE	2	12	16.67	0	0.1783
	Selected Compounds-EPA 502.2 (9)	cis-1,2-DICHLOROETHENE	70	11	36.36	0	0.75
	Tri-Pesticides-EPA 619 (15)	ATRAZINE	3	12	8.33	0	0.3033

Table 5 POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

(Fourth of six pages)

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
B3	CLP Volatiles (1)	ACETONE	.	6	16.67	0	8.1667
	CLP Volatiles (1)	CHLOROFORM	6	6	16.67	0	3
	CLP Volatiles (1)	METHYLENE CHLORIDE	4.7	6	16.67	1	3.6667
	CLP Pesticides/PCBs (7)	HEPTACHLOR	0.00021	6	16.67	0	0.0219
	CLP Pesticides/PCBs (7)	alpha-BHC	0.0039	6	16.67	0	0.0219
	CLP Pesticides/PCBs (7)	alpha-CHLORDANE	.	6	16.67	0	0.2192
	CLP Pesticides/PCBs (7)	beta-BHC	0.014	6	16.67	0	0.0219
	CLP Pesticides/PCBs (7)	gamma-BHC (LINDANE)	0.019	6	16.67	0	0.0219
	CLP Pesticides/PCBs (7)	gamma-CHLORDANE	.	6	16.67	0	0.2192
	Selected Compounds-EPA 502.2 (9)	1,4-DICHLOROBENZENE	75	5	60	0	0.092
	Selected Compounds-EPA 502.2 (9)	BROMODICHLOROMETHANE	0.3	5	40	0	0.17
	Selected Compounds-EPA 502.2 (9)	CHLOROFORM	6	5	100	0	2.9
	Selected Compounds-EPA 502.2 (9)	TETRACHLOROETHENE	0.8	5	60	0	0.04
	Selected Compounds-EPA 502.2 (9)	TRICHLOROETHENE	66	5	80	0	0.078
	Selected Compounds-EPA 502.2 (9)	cis-1,2-DICHLOROETHENE	70	4	25	0	0.08
	Tri-Pesticides-EPA 619 (15)	PROPAZINE	.	5	20	0	0.32

Table 5 POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

(Fifth of six pages)

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
B4-B5	CLP Volatiles (1)	ACETONE	.	120	10	0	15.3575
	CLP Volatiles (1)	METHYLENE CHLORIDE	4.7	121	5.79	7	2.7967
	CLP Volatiles (1)	TETRACHLOROETHENE	0.8	121	1.65	2	2.5992
	CLP Semi-Volatiles (2)	BIS(2-ETHYLHEXYL)PHTHALATE	1.8	31	9.68	3	6.3161
	CLP Pesticides/PCBs (7)	alpha-BHC	0.0039	18	5.56	0	0.0238
	CLP Pesticides/PCBs (7)	alpha-CHLORDANE	.	8	12.5	0	0.2238
	CLP Pesticides/PCBs (7)	beta-BHC	0.014	18	5.56	1	0.0268
	CLP Pesticides/PCBs (7)	gamma-BHC (LINDANE)	0.019	18	5.56	0	0.0238
	CLP Pesticides/PCBs (7)	gamma-CHLORDANE	.	8	12.5	0	0.2238
	Selected Compounds-EPA 502.2 (9)	CHLOROFORM	6	29	62.07	0	0.7428
	Selected Compounds-EPA 502.2 (9)	TETRACHLOROETHENE	0.8	28	25	0	0.1339
	Selected Compounds-EPA 502.2 (9)	TRICHLOROETHENE	66	29	27.59	0	0.3831
	Herbicides-EPA 615 (11)	DICAMBA	.	22	13.64	0	0.2195
	Tri-Pesticides-EPA 619 (15)	ATRAZINE	3	91	83.52	1	0.556
	Tri-Pesticides-EPA 619 (15)	SIMAZINE	4	80	15	0	0.1461
C1		NONE					
C2	CLP Volatiles (1)	METHYLENE CHLORIDE	4.7	105	6.67	7	2.8819
	CLP Volatiles (1)	TETRACHLOROETHENE	0.8	105	0.95	1	2.5857
	CLP Semi-Volatiles (2)	BIS(2-ETHYLHEXYL)PHTHALATE	1.8	23	17.39	4	8.3043
	Selected Compounds-EPA 502.2 (9)	1,1,1-TRICHLOROETHANE	200	22	9.09	0	0.1468
	Tri-Pesticides-EPA 619 (15)	ATRAZINE	3	68	66.18	0	0.2109

Table 5 POND WATER IM/IRA VOA/SVOA PROPOSED CONTAMINANTS OF CONCERN

(Sixth of six pages)

Site	Group	Analyte	CWQCC Standard	Sample Size	Percent Detect	Number of Exceedances	Mean (µg/L)
SW097*	CLP Volatiles (1)	1,1-DICHLOROETHANE	.	17	76.47	0	6.3824
	CLP Volatiles (1)	1,2-DICHLOROETHENE	.	17	35.29	0	4.3529
	CLP Volatiles (1)	2-BUTANONE	.	17	17.65	0	10.6471
	CLP Volatiles (1)	4-METHYL-2-PENTANONE	.	17	11.76	0	9.0294
	CLP Volatiles (1)	ACETONE	.	16	31.25	0	34.9063
	CLP Volatiles (1)	CARBON DISULFIDE	.	17	5.88	0	2.7059
	CLP Volatiles (1)	CHLOROETHANE	.	17	58.82	0	15.2353
	CLP Volatiles (1)	ETHYLBENZENE	680	17	82.35	0	12.9706
	CLP Volatiles (1)	METHYLENE CHLORIDE	4.7	17	29.41	5	15.6176
	CLP Volatiles (1)	TOLUENE	1000	17	88.24	0	44.3235
	CLP Volatiles (1)	TOTAL XYLENES	.	17	76.47	0	14.7647
	CLP Volatiles (1)	VINYL ACETATE	.	17	5.88	0	7.5882
	CLP Volatiles (1)	o-XYLENE	.	3	66.67	0	5.1667
	CLP Semi-Volatiles (2)	2-METHYLNAPHTHALENE	.	3	100	0	22.3333
	CLP Semi-Volatiles (2)	4-METHYLPHENOL	.	3	33.33	0	11
	CLP Semi-Volatiles (2)	NAPHTHALENE	0.0028	3	100	3	20.6667

*SW097=Landfill Pond

APPENDIX E
POTENTIAL BENCHMARKS

APPENDIX E

TABLE OF CONTENTS

TABLE E-1.A
POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS
GROUNDWATER QUALITY STANDARDS

TABLE E-1.A

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
GROUNDWATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (4)	Method (5)	FEDERAL STANDARDS: SDWA Maximum Contaminant Level	FEDERAL STANDARDS: SDWA Maximum Contaminant Level	FEDERAL STANDARDS: SDWA Maximum Contaminant Level Goals	FEDERAL STANDARDS: SDWA Maximum Contaminant Level Goal	FEDERAL STANDARDS: RCRA Subpart F Limit (c)	STATE STANDARDS, CDH WQCC Groundwater Quality Standards (d), Statewide: Table A (d) (6)	Site-Specific (g): Table 1 Human Health	Site-Specific (g): Table 2 Secondary Drinking	Site-Specific (g): Table 3 Agriculture	Table 4 TDS	Table 5 Chronic	Table 6 Radionuclides: Woman Creek	Table 6 Radionuclides: Walnut Creek
Chloride	A	E325	250,000 * (a)							250,000					
Cyanide (Free)	A	E335	200 (h)		200 (h)				200						
Fluoride	A	E340	4,000; 2,000* (a)		4,000 (a)				4,000		2,000				
N as Nitrate	A	E353.1		10,000 (b)		10,000 (b)			10,000						
N as Nitrate+Nitrite	A	E353.1		10,000 (b)		10,000 (b)					100,000				
N as Nitrite	A	E354.1		1,000 (b)		1,000 (b)			1,000		10,000				
Sulfate	A	E375.4	250,000* (a)							250,000					
Sulfide, H2S Undissociated	A	E376.1													
Coliform (Fecal)	B	SM9221C	1/100 ml (a)***						1/100 ml						
Ammonia as N	C	E350													
Dioxin	D	(5)	3.0E-5 (h)		0 (h)			0.00000022					1.3E-06		
Boron	E	SW6010(5B)									750				
Chlorine, Total Residual	E	SM4500													
Sulfur	E														
Dissolved Oxygen	FP	SM4500													
pH (Standard Units)	FP	E150.1	6.5-8.5 * (a)							6.5-8.5	6.5-8.5				
Specific Conductance	FP	E120.1													
Temperature (Degrees Celsius)	FP														
Alkalinity	IN	E310.1													
Asbestos	IN			7MF/l (b)		7MF/l (b)									
Total Dissolved Solids (TDS)	IN	E160.1	500,000* (a)									400,000 (1)			
Total Organic Carbon (TOC)	IN	E415.1													
Aluminum	M	(5)		50 to 200* (b)							5,000				
Antimony	M	(5)	6 (h)		6 (h)										
Arsenic	M	(5)	50 (a)				50		50		100				
Arsenic III	M														
Arsenic V	M														
Barium	M	(5)	2,000 (e)			2,000 (e)	1,000		1,000						
Beryllium	M	(5)	4 (h)		4 (h)						100				
Cadmium	M	(5)	10 (a)	5 (b)		5 (b)	10		10		10				
Calcium	M	(5)													
Cesium	M	(5)													
Chromium	M	(5)	50 (a)	100 (b)		100 (b)	50		50		100				
Chromium III	M														
Chromium VI	M	E218.5													
Cobalt	M	(5)									50				
Copper	M	(5)	1,000 * (a)	1,300 (f)		1,300 (f)				1,000	200				
Iron	M	(5)	300 * (a)							300	5,000				
Lead	M	(5)	50 (a)	15 (f)		0 (f)	50		50		100				
Lithium	M	(5)									2,500				
Magnesium	M	(5)													
Manganese	M	(5)	50 * (a)							50	200				
Mercury	M	(5)	2 (a)	2 (b)		2 (b)	2		2		10				
Molybdenum	M	(5)													
Nickel	M	(5)	100 (h)		100 (h)						200				
Potassium	M	(5)													
Selenium	M	(5)	10 (a)	50 (b)		50 (b)	10		10		20				
Silver	M	(5)	50 (a)	100 * (b)			50		50						
Sodium	M	(5)													
Strontium	M	(5)													
Thallium	M	(5)	2 (h)		0.5 (h)										
Tin	M	(5)													
Titanium	M	SW6010(5B)													
Tungsten	M	SW6010(5B)													
Vanadium	M	(5)									100				
Zinc	M	(5)	5,000 * (a)							5,000	2,000				

TABLE E-1.A (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
GROUNDWATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			FEDERAL STANDARDS					STATE STANDARDS							
								CDH WQCC Groundwater Quality Standards (d)							
								Statewide	Site-Specific (g)						
			SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goal	RCRA Subpart F Limit (c)	Table A (d) (6)	Table 1 Human Health	Table 2 Secondary Drinking	Table 3 Agriculture	Table 4 TDS	Table 5 Chronic	Table 6 Radionuclides	
Parameter	Type (4)	Method (5)												Woman Creek	Walnut Creek
Aldicarb	P		3 (i)		1 (i)			10							
Aldicarb Sulfone	P		2 (i)		1 (i)										
Aldicarb Sulfoxide	P		4 (i)		1 (i)										
Aldrin	P	(5)						0.002					0.0000784		
Carbofuran	P	(5C)		40 (b)		40 (b)		36							
Chloranil	P														
Chlordane	P	(5)		2 (b)		0 (b)		0.03					0.00046		
Chlorpyifos	P	(5)													
DDT	P	(5)						0.1					0.000024		
DDT Metabolite (DDD)	P	(5)													
DDT Metabolite (DDE)	P	(5)						0.1							
Demeton	P	(5)													
Diazinon	P	(5)													
Dieldrin	P	(5)						0.002					0.000071		
Endosulfan I	P	(5)													
Endosulfan II	P	(5)													
Endosulfan sulfate	P	(5)													
Endrin	P	(5)	2 (h)		2 (h)		0.2	0.2							
Endrin Aldehyde	P	(5B)						0.2							
Endrin Ketone	P	(5B)													
Guthion (Azinphos methyl)	P	(5)													
Heptachlor	P	(5)		0.4 (b)		0 (b)		0.008					0.00028		
Heptachlor Epoxide	P	(5)		0.2 (b)		0 (b)		0.09							
Hexachlorocyclohexane, Alpha	P	(5)						0.006					0.0092		
Hexachlorocyclohexane, Beta	P	(5)											0.0163		
Hexachlorocyclohexane (HCH or BHC)	P														
Hexachlorocyclohexane, Delta	P	(5)													
Hexachlorocyclohexane, Technical (Total)	P	(5E)											0.0123		
Hexachlorocyclohexane, Gamma (Lindane)	P	(5)	4 (a)	0.2 (b)		0.2 (b)	4.0	0.2					0.0186		
Malathion	P	(5B)													
Methoxychlor	P	(5)	100 (a)	40 (b)		40 (b)	100	40							
Mirex	P														
Oxamyl (Vydate)	P		200 (h)		200 (h)										
Parathion	P	(5B)													
Toxaphene	P	(5)		3 (b)		0 (b)	5.0	0.03							
Vaponite 2	P														
Aroclor 1016	PP	(5)													
Aroclor 1221	PP	(5)													
Aroclor 1232	PP	(5)													
Aroclor 1242	PP	(5)													
Aroclor 1248	PP	(5)													
Aroclor 1254	PP	(5)													
Aroclor 1260	PP	(5)													
PCBs (Total)	PP	(5)		0.5 (b)		0 (b)		0.005					0.000079		
2,4,5-TP Silvex	H	(5C)	10 (a)	50 (b)		50 (b)	10	50							
2,4-Dichlorophenoxyacetic Acid (2,4-D)	H	(5C)	100 (a)	70 (b)		70 (b)	100	70							
Acrolein	H														
Atrazine	H	(5D)		3 (b)		3 (b)							3		
Bromacil	H														
Dalapon	H	(5)	200 (h)		200 (h)										
Dinoseb	H	(5)	7 (h)		7 (h)										
Diquat	H		20 (h)		20 (h)										
Endothall	H		100 (h)		100 (h)										
Glyphosate	H		700 (h)		700 (h)										
Picloram	H		500 (h)		500 (h)										
Simazine	H	(5D)	4 (h)		4 (h)								4		
Americium (total) (pCi/l)	R													0.05	0.05
Americium 241 (pCi/l)	R														
Cesium 134 (pCi/l)	R		(8)					80						80	80
Cesium 137 (pCi/l)	R		(8)												

TABLE E-1.A (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
GROUNDWATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			FEDERAL STANDARDS					STATE STANDARDS: CDH WQCC Groundwater Quality Standards (d)							
								Statewide	Site-Specific (g)						
Parameter	Type (4)	Method (5)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goal	RCRA Subpart F Limit (c)	Table A (d) (6)	Table 1 Human Health	Table 2 Secondary Drinking	Table 3 Agriculture	Table 4 TDS	Table 5 Chronic	Table 6 Radionuclides Woman Creek	Table 6 Radionuclides Walnut Creek
Gross Alpha (pCi/l)	R		15 (a)(7)						15(7)					7	11
Gross Beta (pCi/l)	R		50 (a)(2)(8)						(8)					5	19
Plutonium (total) (pCi/l)	R													0.05	0.05
Plutonium 238+239+240 (pCi/l)	R							15						15	15
Radium 226+228 (pCi/l)	R	(3)	20 (a)(8)					5						5	5
Strontium 89+90 (pCi/l)	R		(a)(2)(8)												
Strontium 90 (pCi/l)	R		8 (a)(2)(8)					8						8	8
Thorium 230+232 (pCi/l)	R		(a)(8)					60						60	60
Tritium (pCi/l)	R		20,000 (a)(2)(8)					20,000						500	500
Uranium 233+234 (pCi/l)	R														
Uranium 235 (pCi/l)	R														
Uranium 238 (pCi/l)	R													5	10
Uranium (Total) (pCi/l)	R														
1,2,4,5-Tetrachlorobenzene	SV	(5B)						2							
1,2,4-Trichlorobenzene	SV	(5)	70 (h)		70 (h)										
1,2-Dichlorobenzene (Ortho)	SV	(5)		600 (b)		600 (b)		620							
1,2-Diphenylhydrazine	SV	(5B)						0.05							
1,3-Dichlorobenzene (Meta)	SV	(5)						620							
1,4-Dichlorobenzene (Para)	SV	(5)	75 (a)		75 (a)			75							
2,4,5-Trichlorophenol	SV	(5)											1.2		
2,4,6-Trichlorophenol	SV	(5)						2							
2,4-Dichlorophenol	SV	(5)						21							
2,4-Dimethylphenol	SV	(5)													
2,4-Dinitrophenol	SV	(5)						14							
2,4-Dinitrotoluene	SV	(5)													
2,6-Dinitrotoluene	SV	(5)													
2-Chloronaphthalene	SV	(5)													
2-Chlorophenol	SV	(5)													
2-Methylnaphthalene	SV	(5)													
2-Methylphenol	SV	(5)													
2-Nitroaniline	SV	(5)													
2-Nitrophenol	SV	(5)													
3,3'-Dichlorobenzidine	SV	(5)													
3-Nitroaniline	SV	(5)													
4,6-Dinitro-2-methylphenol	SV	(5)													
4-Bromophenyl-phenyl-ether	SV	(5)													
4-Chloroaniline	SV	(5)													
4-Chlorophenyl-phenyl-ether	SV	(5)													
4-Chloro-3-methylphenol	SV	(5)													
4-Methylphenol	SV	(5)													
4-Nitroaniline	SV	(5)													
4-Nitrophenol	SV	(5)													
Acenaphthene	SV	(5)													
Anthracene	SV	(5)													
Benzidine	SV	(5bc)						0.0002					0.00012		
Benzoic Acid	SV	(5)													
Benzo(a)anthracene	SV	(5)													
Benzo(a)pyrene	SV	(5)	0.2 (h)		0 (h)										
Benzo(b)fluoranthene	SV	(5)													
Benzo(g,h,i)perylene	SV	(5)													
Benzo(k)fluoranthene	SV	(5)													
Benzyl Alcohol	SV	(5)													
bis(2-Chloroethoxy)methane	SV	(5)													
bis(Chloroethyl)ether	SV	(5)						0.03					0.0000037		
bis(2-Chloroisopropyl)ether	SV	(5)													
bis(2-Ethylhexyl)phthalate (Di(2-ethylhexyl)phthalate)	SV	(5)	6 (h)		0 (h)										
Butadiene	SV														
Butylbenzylphthalate	SV	(5)													
Chlorinated Ethers	SV	(5)													
Chlorinated Napthalenes	SV	(5)													
Chloroalkylethers	SV	(5)													

TABLE E-1.A (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
GROUNDWATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			FEDERAL STANDARDS					STATE STANDARDS							
								CDH WQCC Groundwater Quality Standards (d)							
								Statewide	Site-Specific (g)						
			SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goal	RCRA Subpart F Limit (c)	Table A (d) (f)	Table 1 Human Health	Table 2 Secondary Drinking	Table 3 Agriculture	Table 4 TDS	Table 5 Chronic	Table 6 Radionuclides	
Parameter	Type (4)	Method (5)												Woman Creek	Walnut Creek
Chlorophenol (Total)	SV	(5)							1						
Chrysene	SV	(5)													
Dibenzofuran	SV	(5)													
Dibenz(a,h)anthracene	SV	(5)													
Dichlorobenzenes	SV	(5)													
Dichlorobenzidine (Total)	SV	(5)											0.01		
Diethylphthalate	SV	(5)													
Di(2-ethylhexyl)adipate	SV	(5)	400 (h)		400 (h)										
Dimethylphthalate	SV	(5)													
Di-n-butylphthalate	SV	(5)													
Di-n-octylphthalate	SV	(5)													
Ethylene Glycol	SV	(5C)													
Fluoranthene	SV	(5)													
Fluorene	SV	(5)													
Formaldehyde	SV														
Haloethers	SV	(5)													
Hexachlorobenzene	SV	(5)	1 (h)		0 (h)			6					0.00072		
Hexachlorobutadiene	SV	(5)						1					0.45		
Hexachlorocyclopentadiene	SV	(5)	50 (h)		50 (h)										
Hexachloroethane	SV	(5)											1.9		
Hydrazine	SV														
Indeno(1,2,3-cd)pyrene	SV	(5)													
Isophorone	SV	(5)						1,050							
Naphthalene	SV	(5)													
Nitrobenzene	SV	(5)						3.5							
Nitrophenols	SV	(5)													
Nitrosamines	SV	(5)													
N-Nitrosodibutylamine	SV	(5B)											0.0064		
N-Nitrosodiethylamine	SV	(5B)											0.0008		
N-Nitrosodimethylamine	SV	(5B)											0.0014		
N-Nitrosopyrrolidine	SV	(5B)											0.016		
N-Nitrosodiphenylamine	SV	(5B)											4.9		
N-Nitroso-di-n-propylamine	SV	(5B)													
Pentachlorinated Ethanes	SV	(5B)													
Pentachlorobenzene	SV	(5B)						6 (6)							
Pentachlorophenol	SV	(5)		1 (e)		0 (e)		200							
Phenanthrene	SV	(5)													
Phenol	SV	(5)							1						
Phthalate Esters	SV	(5)													
Polynuclear Aromatic Hydrocarbons	SV	(5)											0.0028		
Pyrene	SV	(5)													
Vinyl Chloride	V	(5)	2 (a)		0 (a)			2							
1,1,1-Trichloroethane	V	(5)	200 (a)		200 (a)			200							
1,1,2,2-Tetrachloroethane	V	(5)											0.17		
1,1,2-Trichloroethane	V	(5)	5 (h)		3 (h)			3					0.6		
1,1-Dichloroethane	V	(5)													
1,1-Dichloroethene	V	(5)	7 (a)		7 (a)			7							
1,2-Dichloroethane	V	(5)	5 (a)		0 (a)			0.4							
1,2-Dichloroethene (cis)	V	(5)		70 (b)		70 (b)		70							
1,2-Dichloroethene (total)	V	(5)													
1,2-Dichloroethene (trans)	V	(5)		100 (b)		100 (b)		100							
1,2-Dichloropropane	V	(5)		5 (b)		0 (b)		0.56							
1,3-Dichloropropene (cis)	V	(5)													
1,3-Dichloropropene (trans)	V	(5)													
2-Butanone	V	(5)													
2-Hexanone	V	(5)													
4-Methyl-2-pentanone	V	(5)													
Acetone	V	(5)													
Acrylonitrile	V	(5)											0.058		
Benzene	V	(5)	5 (a)		0 (a)			1							
Bromodichloromethane	V	(5)	<100** (a)					0.3							

TABLE E-1.A (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
GROUNDWATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			FEDERAL STANDARDS					STATE STANDARDS							
								CDH WQCC Groundwater Quality Standards (d)							
								Statewide	Site-Specific (g)						
Parameter	Type (4)	Method (5)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goal	RCRA Subpart F Limit (c)	Table A (d) (f)	Table 1 Human Health	Table 2 Secondary Drinking	Table 3 Agriculture	Table 4 TDS	Table 5 Chronic	Table 6 Radionuclides Woman Creek	Table 6 Radionuclides Walnut Creek
Bromoform	V	(5)	<100** (a)					4							
Bromomethane	V	(5)													
Carbon Disulfide	V	(5)													
Carbon Tetrachloride	V	(5)	5 (a)		0 (a)			0.3							
Chlorinated Benzenes	V/SV	(5)													
Chlorobenzene	V	(5)		100 (b)		100 (b)		100							
Chloroethane	V	(5)													
Chloroform	V	(5)	<100** (a)					6					0.19		
Chloromethane	V	(5)													
Dibromochloromethane	V	(5)	<100** (a)					14							
Dichloroethenes	V	(5)													
Ethyl Benzene	V	(5)		700 (b)		700 (b)		680							
Ethylene Dibromide	V	(5C)		0.05 (b)		*0 (b)*									
Ethylene Oxide	V														
Halomethanes	V	(5)	100 (a)										*0.19*		
Methylene Chloride	V	(5)	5 (h)		0 (h)										
Styrene	V	(5)		100 (b)		100 (b)									
Tetrachloroethanes	V	(5)													
Tetrachloroethene	V	(5)		5 (b)		0 (b)		5					0.8		
Toluene	V	(5)		1,000 (b)		1,000 (b)		1,000							
Trichloroethanes	V	(5)													
Trichloroethene	V	(5)	5 (a)		0 (a)			5							
Vinyl Acetate	V	(5)													
Xylenes (total)	V	(5)		10,000 (b)		10,000 (b)									

TABLE E-1.A (continued)

EXPLANATION OF TABLE A AND ENDNOTES

* = secondary maximum contaminant level; TBCs

** = total trihalomethanes: chloroform, bromoform, bromodichloromethane, dibromochloromethane

*** = Positive sample no more than once/month (<40 samples/month)

ARAR = Applicable on Relavent and Appropriate Requirement
CDH – Colorado Department of Health
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
CFR – Code of Federal Regulations
EPA = Environmental Protection Agency
NCP = National Contingency Plan
pCi/l = picocuries per liter
PCB = polychlorinated biphenyl
RFP = Rocky Flats Plant
SDWA = Safe Drinking Water Act
SW = Solid Waste
TIC = Tentatively Identified Compound
ug/l = micrograms per liter
WQCC = Water Quality Control Commission
MF/l = million fibers/liter

(1) TDS standard - see Table 4 in (d); standard is 400 mg/l or 1.25 times the background level, whichever is least restrictive
(2) If both strontium-90 and tritium are present, the sum of their annual dose equivalents to bone marrow shall not exceed 4 mrem/yr
(3) MDL for Radium 226 is 0.5; MDL for radium 228 is 1
(4) Type abbreviations are: A=anion; B=bacteria; C=cation; D=dioxin; E=element; FP=field parameter; H=herbicide; IN=inorganic; M=metal; P=pesticide; PP=pesticide/PCB; R=radionuclide; SV=semi-volatile; V=volatile
(5) See Attachment 1 for analytical methods with corresponding analytes and detection limits abbreviations are: E=EPA; SW=SW846; A=detected as total; B=detected as TICs or with method modifications; C=not routinely monitored; D=monitored in discharge ponds; E=mixture-individual isomers detected
(6) Where the standard is below (more stringent than) the PQL, the PQL is interpreted to be compliance level
(7) Value for gross alpha excludes uranium
(8) Average annual concentration of beta particles and photon radioactivity cannot exceed 4 millirem/year dose equivalent

(a) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR 141 and 40 CFR 143 (as of 5/19/90)
(b) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR Parts 141, 142, 143, Final Rule, Effective July 30, 1992 (56 Federal Register 3526; 1/30/1991)
(c) NCP, 40 CFR 300; NCP Preamble 55 FR 8764; CERCLA Compliance with Other Laws Manual, EPA/540/G-89/006, August 1988, 40 CFR 264.94
(d) CDH/Water Quality Control Commission, The Basic Standards for Ground Water, 3.11.0 (5 CCR 1002-8) 1/5/1987 effective 11/30/1991; statewide radioactive standards listed in 3.11.5(c)(2)
(e) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR Parts 141, 142, 143, Final Rule, Effective January 1, 1993 (56 FR 30266; 7/1/1991)
(f) EPA Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper, 40 CFR 141 and 142 (56 FR 26460; 6/7/91), and 57 FR 28785; 6/29/92 effective 12/7/92 and 11/6/91. Action le MCLGs effective 11/6/91. Action level in 10% or less of tap samples for small and medium-sized systems.
(g) CDH/Water Quality Control Commission, Classifications and Water Quality Standards for Ground Water, 3.12.0 (9/19/1991)
(h) EPA National Primary Drinking Water Regulations, 40 CFR 141 and 142, Final Rule, Effective January 17, 1994
(i) EPA National Primary Drinking Water Regulations, 40 CFR 141, Postponement of Final Rule and Reconsideration (57 FR 22178) - no effective date established.

TABLE E-1.B
POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS
FEDERAL SURFACE WATER QUALITY STANDARDS

TABLE E-1.B

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
FEDERAL SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (7)	Method (8)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goals	CWA AWQC for Protection of Aquatic Life (c) Acute Value	Chronic Value	CWA AWQC for Protection of Human Health (c) Water and Fish Ingestion	Fish Consumption Only
Chloride	A	E325	250,000 * (a)				860,000(g)	230,000(g)		
Cyanide (Free)	A	E335	200 (h)		200 (h)		22	5.2	200	
Flouride	A	E340	4,000; 2,000* (a)		4,000 (a)					
N as Nitrate	A	E353.1		10,000 (b)		10,000 (b)			10,000	
N as Nitrate+Nitrite	A	E353.1		10,000 (b)		10,000 (b)				
N as Nitrite	A	E354.1		1,000 (b)		1,000 (b)				
Sulfate	A	E375.4	250,000* (a)							
Sulfide, H2S Undissociated	A	E376.1						2		
Coliform (Fecal)	B	SM9221C	1/100 ml (a)							
Ammonia as N	C	E350					***			
Dioxin	D	(8)	3.0E-5 (h)		0 (h)		0.01	0.00001	0.000000013	0.000000014
Boron	E	SW6010(8B)								
Chlorine, Total Residual	E	SM4500					19	11		
Sulfur	E									
Dissolved Oxygen	FP	SM4500					5,000			
pH (Standard Units)	FP	E150.1	6.5-8.5 * (a)					6.5-9		
Specific Conductance	FP	E120.1								
Temperature (Degrees Celsius)	FP						$$	$$		
Alkalinity	IN	E310.1						20,000		
Asbestos	IN			7MF/l (b)		7MF/l (b)				300,000 F/L**
Total Dissolved Solids	IN	E160.1	500,000* (a)				$$	$$	250,000	
Total Organic Carbon	IN	E415.1								
Aluminum	M	(8)		50 to 200* (b)			750	87		
Antimony	M	(8)	6 (h)		6 (h)		9,000	1,600	146	45,000
Arsenic	M	(8)	50 (a)						0.0022	0.0175
Arsenic III	M						360	190		
Arsenic V	M						850	48		
Barium	M	(8)	2,000 (e)		2,000 (e)				1,000	
Beryllium	M	(8)	4 (h)		4 (h)		130	5.3	.0068**	.117**
Cadmium	M	(8)	10 (a)	5 (b)		5 (b)	3.9 (3)	1.1 (3)	10	
Calcium	M	(8)								
Cesium	M	(8)								
Chromium	M	(8)	50 (a)	100 (b)		100 (b)				
Chromium III	M						1,700 (3)	210 (3)	170,000	3,433,000
Chromium VI	M	E218.5					16	11	50	
Cobalt	M	(8)								
Copper	M	(8)	1,000 * (a)	1,300 (f)		1,300 (f)	18 (3)	12 (3)		
Iron	M	(8)	300 * (a)					1,000	300	
Lead	M	(8)	50 (a)	15 (f)		0 (f)	82 (3)	3.2 (3)	50	
Lithium	M	(8)								
Magnesium	M	(8)								
Manganese	M	(8)	50 * (a)						50	100
Mercury	M	(8)	2 (a)	2 (b)		2 (b)	2.4	0.012	0.144	0.146
Molybdenum	M	(8)								
Nickel	M	(8)	100 (h)		100 (h)		1,400 (3)	160 (3)	13.4	100
Potassium	M	(8)								
Selenium	M	(8)	10 (a)	50 (b)		50 (b)	20 (d)	5 (d)	10	
Silver	M	(8)	50 (a)	100* (b)			4.1 (3)	0.12	50	
Sodium	M	(8)								
Strontium	M	(8)								
Thallium	M	(8)	2 (h)		0.5 (h)		1,400 (1)	40 (1)	13	48
Tin	M	(8)								
Titanium	M	SW6010(8B)								
Tungsten	M	SW6010(8B)								
Vanadium	M	(8)								
Zinc	M	(8)	5,000 * (a)				120 (3)	110 (3)		

TABLE E-1.B (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
FEDERAL SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (7)	Method (8)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goals	CWA AWQC for Protection of Aquatic Life (c) Acute Value	CWA AWQC for Protection of Aquatic Life (c) Chronic Value	CWA AWQC for Protection of Human Health (c) Water and Fish Ingestion	CWA AWQC for Protection of Human Health (c) Fish Consumption Only
Aldicarb	P		3 (i)		1 (i)					
Aldicarb Sulfone	P		2 (i)		1 (i)				10	
Aldicarb Sulfoxide	P		4 (i)		1 (i)				100	
Aldrin	P	(8)					3.0		0.000074	0.000079
Carbofuran	P	(8C)		40 (b)		40 (b)				
Chloranil	P									
Chlordane	P	(8)		2 (b)		0 (b)	2.4	0.0043	0.00046	0.00048
Chlorpyifos	P	(8)					0.063	0.041		
DDT	P	(8)					1.1	0.001	0.000024	0.000024
DDT metabolite (DDD)	P	(8)					0.06			
DDT metabolite (DDE)	P	(8)					1,050			
Demeton	P	(8)						0.1		
Diazinon	P	(8)								
Dieldrin	P	(8)					2.5	0.0019	0.000071	0.000076
Endosulfan I	P	(8)					0.22	0.056	74	159
Endosulfan II	P	(8)								
Endosulfan Sulfate	P	(8)								
Endrin	P	(8)	2 (h)		2 (h)		0.18	0.0023	1	
Endrin Aldehyde	P	(8B)								
Endrin Ketone	P	(8B)								
Guthion (Azinphos methyl)	P	(8)						0.01		
Heptachlor	P	(8)		0.4 (b)		0 (b)	0.52	0.0038	0.00028	0.00029
Heptachlor Epoxide	P	(8)		0.2 (b)		0 (b)				
Hexachlorocyclohexane, Alpha	P	(8)							0.0092	0.031
Hexachlorocyclohexane, Beta	P	(8)							0.0163	0.0547
Hexachlorocyclohexane (HCH or BHC)	P						100			
Hexachlorocyclohexane, Delta	P	(8)								
Hexachlorocyclohexane, Technical (Total)	P	(8E)							0.0123	0.0414
Hexachlorocyclohexane, Gamma (Lindane)	P	(8)	4 (a)	0.2 (b)		0.2 (b)	2	0.08	0.0186	0.0625
Malathion	P	(8B)						0.01		
Methoxychlor	P	(8)	100 (a)	40 (b)		40 (b)		0.03	100	
Mirex	P							0.001		
Oxamyl (Vydate)	P		200 (h)		200 (h)			0.001		
Parathion	P	(8B)					0.065	0.013		
Toxaphene	P	(8)		3 (b)		0 (b)	0.73	0.0002	0.00071**	0.00073**
Vaponite 2	P									
Aroclor 1016	PP	(8)								
Aroclor 1221	PP	(8)								
Aroclor 1232	PP	(8)								
Aroclor 1242	PP	(8)								
Aroclor 1248	PP	(8)								
Aroclor 1254	PP	(8)								
Aroclor 1260	PP	(8)								
PCBs (Total)	PP	(8)		0.5 (b)		0 (b)	2	0.014	0.000079**	0.000079**
2,4,5-TP Silvex	H	(8C)	10 (a)	50 (b)		50 (b)			10	
2,4-Dichlorophenoxyacetic Acid (2,4-D)	H	(8C)	100 (a)	70 (b)		70 (b)			100	
Acrolein	H						68(1)	21(1)	320	780
Atrazine	H	(8D)		3 (b)		3 (b)				
Bromacil	H									
Dalapon	H	(8)	200 (h)		200 (h)					
Dinoseb	H	(8)	7 (h)		7 (h)					
Diquat	H		20 (h)		20 (h)					
Endothall	H		100 (h)		100 (h)					
Glyphosate	H		700 (h)		700 (h)					
Picloram	H		500 (h)		500 (h)					
Simazine	H	(8D)	4 (h)		4 (h)					
Americium (total)(pCi/l)	R									
Americium 241 (pCi/l)	R									

TABLE E-1.B (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
FEDERAL SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (7)	Method (8)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goals	CWA AWQC for Protection of Aquatic Life (c)		CWA AWQC for Protection of Human Health (c)	
							Acute Value	Chronic Value	Water and Fish Ingestion	Fish Consumption Only
Cesium 134 (pCi/l)	R		(4)							
Cesium 137 (pCi/l)	R		(4)							
Gross Alpha (pCi/l)	R		15 (a)(9)							
Gross Beta (pCi/l)	R		50 (a)(4)(6)							
Plutonium (total)(pCi/l)	R									
Plutonium 238+239+240 (pCi/l)	R									
Radium 226+228 (pCi/l)	R	(10)	5 (a)(4)							
Strontium 89+90 (pCi/l)	R		(a)(4)(6)							
Strontium 90 (pCi/l)	R		8 (a)(6)							
Thorium 230+232 (pCi/l)	R		(a)(4)							
Tritium (pCi/l)	R		20,000 (a)(4)(6)							
Uranium 233+234 (pCi/l)	R									
Uranium 235 (pCi/l)	R									
Uranium 238 (pCi/l)	R									
Uranium (total) (pCi/l)	R									
1,2,4,5-Tetrachlorobenzene	SV	(8B)							38	48
1,2,4-Trichlorobenzene	SV	(8)	70 (h)		70 (h)					
1,2-Dichlorobenzene (Ortho)	SV	(8)		600 (b)		600 (b)				
1,2-Diphenylhydrazine	SV	(8B)					270 (1)		0.042	0.56
1,3-Dichlorobenzene (Meta)	SV	(8)								
1,4-Dichlorobenzene (Para)	SV	(8)	75 (a)		75 (a)					
2,4,5-Trichlorophenol	SV	(8)							2,600	
2,4,6-Trichlorophenol	SV	(8)						970 (1)	1.2 **	3.6 **
2,4-Dichlorophenol	SV	(8)					2,020 (1)	365 (1)	3,090	
2,4-Dimethylphenol	SV	(8)					2,120 (1)			
2,4-Dinitrophenol	SV	(8)								
2,4-Dinitrotoluene	SV	(8)					330(1)	230(1)	0.11 **	9.1 **
2,6-Dinitrotoluene	SV	(8)					330 (1)	230 (1)	70	14,300
2-Chloronaphthalene	SV	(8)								
2-Chlorophenol	SV	(8)					4,380 (1)	2,000 (1)		
2-Methylnaphthalene	SV	(8)								
2-Methylphenol	SV	(8)								
2-Nitroaniline	SV	(8)								
2-Nitrophenol	SV	(8)					230(1)	150(1)		
3,3'-Dichlorobenzidine	SV	(8)							0.01	0.02
3-Nitroaniline	SV	(8)								
4,6-Dinitro-2-methylphenol	SV	(8)							13.4	765
4-Bromophenyl-phenyl-ether	SV	(8)								
4-Chloroaniline	SV	(8)								
4-Chlorophenyl-phenyl-ether	SV	(8)								
4-Chloro-3-methylphenol	SV	(8)					30 (1)			
4-Methylphenol	SV	(8)								
4-Nitroaniline	SV	(8)								
4-Nitrophenol	SV	(8)					230 (1)	150 (1)		
Acenaphthene	SV	(8)					1,700 (1)	520 (1)		
Anthracene	SV	(8)								
Benzidine	SV	(8B,C)					2,500		0.00012	0.00053
Benzoic Acid	SV	(8)								
Benzo(a)anthracene	SV	(8)								
Benzo(a)pyrene	SV	(8)	0.2 (h)		0 (h)					
Benzo(b)fluoranthene	SV	(8)								
Benzo(g,h,i)perylene	SV	(8)								
Benzo(k)fluoranthene	SV	(8)								
Benzyl Alcohol	SV	(8)								
bis(2-Chloroethoxy)methane	SV	(8)								
bis(2-Chloroethyl)ether	SV	(8)							0.03**	1.36 **
bis(Chloromethyl)ether	SV								0.00376	0.00184
bis(2-Chloroisopropyl)ether	SV	(8)							34.7	4,360
bis(2-Ethylhexyl)phthalate (Di(2-ethylhexyl)phthalate)	SV	(8)	0 (h)		0 (h)					
Butadiene	SV									
Butylbenzylphthalate	SV	(8)								

TABLE E-1.B (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
FEDERAL SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (7)	Method (8)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goals	CWA AWQC for Protection of Aquatic Life (c) Acute Value	CWA AWQC for Protection of Aquatic Life (c) Chronic Value	CWA AWQC for Protection of Human Health (c) Water and Fish Ingestion	CWA AWQC for Protection of Human Health (c) Fish Consumption Only
Chlorinated Ethers	SV	(8)								
Chlorinated Napthalenes	SV	(8)					1,600 (1)			
Chloroalkylethers	SV	(8)					238,000 (1)			
Chlorophenol (Total)	SV	(8)								
Chrysene	SV	(8)								
Dibenzofuran	SV	(8)								
Dibenz(a,h)anthracene	SV	(8)								
Dichlorobenzenes	SV	(8)					1,120 (1)	763 (1)	400	2,600
Dichlorobenzidine (Total)	SV	(8)							0.01	0.02
Diethylphthalate	SV	(8)							350,000	1,800,000
Di(2-ethylhexyl)adipate	SV	(8)	400 (h)		400 (h)					
Dimethylphthalate	SV	(8)							313,000	2,900,000
Di-n-butylphthalate	SV	(8)							35,000	154,000
Di-n-octylphthalate	SV	(8)								
Ethylene Glycol	SV	(8C)								
Fluoranthene	SV	(8)					3,980 (1)		42	54
Fluorene	SV	(8)								
Formaldehyde	SV									
Haloethers	SV	(8)					360 (1)	122 (1)		
Hexachlorobenzene	SV	(8)	1 (h)		0 (h)				0.00072**	0.00074**
Hexachlorobutadiene	SV	(8)					90 (1)	9.3 (1)	0.45**	50 **
Hexachlorocyclopentadiene	SV	(8)	50 (h)		50 (h)		7 (1)	5.2 (1)	206	
Hexachloroethane	SV	(8)					980 (1)	540 (1)	1.9	8.74
Hydrazine	SV									
Indeno(1,2,3-cd)pyrene	SV	(8)								
Isophorone	SV	(8)					117,000 (1)		5,200	520,000
Naphthalene	SV	(8)					2,300 (1)	620 (1)		
Nitrobenzene	SV	(8)					27,000 (1)		19,800	
Nitrophenols	SV	(8)					230 (1)	150 (1)		
Nitrosamines	SV	(8)					5,850 (1)			
N-Nitrosodibutylamine	SV	(8B)							0.0064	0.587
N-Nitrosodiethylamine	SV	(8B)							0.0008	1.24
N-Nitrosodimethylamine	SV	(8B)							0.0014	16
N-Nitrosopyrrolidine	SV	(8B)							0.016	91.9
N-Nitrosodiphenylamine	SV	(8B)							4.9 **	16.1 **
N-Nitroso-di-n-propylamine	SV	(8B)								
Pentachlorinated Ethanes	SV	(8B)					7,240 (1)	1,100 (1)		
Pentachlorobenzene	SV	(8B)							74	85
Pentachlorophenol	SV	(8)		1 (e)		0 (e)	20 ***	13 ***	1,010	
Phenanthrene	SV	(8)								
Phenol	SV	(8)					10,200 (1)	2,560 (1)	3,500	
Phthalate Esters	SV	(8)					940 (1)	3 (1)		
Polynuclear Aromatic Hydrocarbons	SV	(8)							0.0028**	0.0311**
Pyrene	SV	(8)								
Vinyl Chloride	V	(8)	2 (a)		0 (a)				2 **	525 **
1,1,1-Trichloroethane	V	(8)	200 (a)		200 (a)				18,400	1,030,000
1,1,2,2-Tetrachloroethane	V	(8)						2,400	0.17**	10.7 **
1,1,2-Trichloroethane	V	(8)	5 (h)		3 (h)			9,400	0.6**	41.8 **
1,1-Dichloroethane	V	(8)								
1,1-Dichloroethene	V	(8)	7 (a)		7 (a)					
1,2-Dichloroethane	V	(8)	5 (a)		0 (a)		118,000	20,000	0.94**	243 **
1,2-Dichloroethene (cis)	V	(8)		70 (b)		70 (b)				
1,2-Dichloroethene (total)	V	(8)								
1,2-Dichloroethene (trans)	V	(8)		100 (b)		100 (b)				
1,2-Dichloropropane	V	(8)		5 (b)		0 (b)	23,000	5,700		
1,3-Dichloropropene (cis)	V	(8)					6,060	244 (1)	87	14,100
1,3-Dichloropropene (trans)	V	(8)					6,060	244 (1)	87	14,100
2-Butanone	V	(8)								
2-Hexanone	V	(8)								
4-Methyl-2-pentanone	V	(8)								
Acetone	V	(8)								

TABLE E-1.B (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
FEDERAL SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

Parameter	Type (7)	Method (8)	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level	SDWA Maximum Contaminant Level Goals	SDWA Maximum Contaminant Level Goals	CWA AWQC for Protection of Aquatic Life (c)		CWA AWQC for Protection of Human Health (c)	
							Acute Value	Chronic Value	Water and Fish Ingestion	Fish Consumption Only
Acrylonitrile	V	(8)					7,550	2,600	0.058	0.65
Benzene	V	(8)	5 (a)		0 (a)		5,300		0.66**	40 **
Bromodichloromethane	V	(8)	<100 (2)(a)							
Bromoform	V	(8)	<100 (2)(a)							
Bromomethane	V	(8)								
Carbon Disulfide	V	(8)								
Carbon Tetrachloride	V	(8)	5 (a)		0 (a)		35,200 (1)		0.4**	6.94 **
Chlorinated Benzenes	V/SV	(8)					250 (1)	50 (1)		
Chlorobenzene	V	(8)		100 (b)		100 (b)			488	
Chloroethane	V	(8)								
Chloroform	V	(8)	<100 (2)(a)				28,900 (1)	1,240 (1)	0.19 **	15.7 **
Chloromethane	V	(8)								
Dibromochloromethane	V	(8)	<100 (2)(a)							
Dichloroethenes	V	(8)					11,600 (1)		0.033**	1.85 **
Ethylbenzene	V	(8)		700 (b)		700 (b)	32,000 (1)		1,400	3,280
Ethylene Dibromide	V	(8C)		0.05 (b)		0 (b)				
Ethylene Oxide	V									
Halomethanes	V	(8)	100 (a)				11,000 (1)		0.19**	15.7 **
Methylene Chloride	V	(8)	5 (h)		0 (h)					
Styrene	V	(8)		100 (b)		100 (b)				
Tetrachloroethanes	V	(8)					9,320 (1)			
Tetrachloroethene	V	(8)		5 (b)		0 (b)	5,280 (1)	840 (1)	0.80**	8.85 **
Toluene	V	(8)		1,000 (b)		1,000 (b)	17,500 (1)		14,300	424,000
Trichloroethanes	V	(8)					18,000 (1)			
Trichloroethene	V	(8)	5 (a)		0 (a)		45,000 (1)	21,900 (1)	2.7 **	80.7 **
Vinyl Acetate	V	(8)								
Xylenes (total)	V	(8)		10,000 (b)		10,000 (b)				

TABLE E-1.B (continued)

EXPLANATION OF TABLE B AND END NOTES

* = secondary maximum contaminant level, TBCs

** = Human health criteria for carcinogens reported for three risk levels. Value presented is the 10-5 risk level.

*** = Concentration is pH dependent

ARAR = Applicable or Relevent and Appropriate Requirement
AWQC = Ambient Water Quality Criteria
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
CWA = Clean Water Act
EPA = Environmental Protection Agency
pCi/l = picocuries per liter
PCB = polychlorinated biphenyl
SDWA = Safe Drinking Water Act
SS = Species Specific
SW = Solid Waste
TIC = Tentatively Identified Compound
ug/l = micrograms per liter
MF/L = million fibers/liter

(1) Criteria not developed; value presented is lowest observed effects level (LOEL)
(2) Total trihalomethanes: chloroform, bromoform, bromodichloromethane, dibromochloromethane
(3) Hardness dependent criteria, calculated assuming 50mg/l calcium carbonate
(4) Average annual concentration of beta particles and photon radioactivity cannot exceed 4 millirem/year dose equivalent.
(5) Standard is not adequately protective when chloride is associated with potassium, calcium, or magnesium, rather than sodium.
(6) If both strontium-90 and tritium are present, the sum of their annual dose equivalents to bone marrow shall not exceed 4 mrem/yr.
(7) Type abbreviations are: A=anion; B=bacteria; C=cation; D=dioxin; E=element; H=herbicide; IN=inorganic; FP=field parameter; M=metal; P=pesticide; PP=pesticide/PCB; R=radionuclide; SV=semi-volatile; V=volatile
(8) See Attachment 1 for analytical methods with corresponding detection limits abbreviations are: E=EPA; SW=SW846; A = detected as total; B = detected as TICs or with method modifications; C = not routinely monitored; D = monitored in discharge ponds; E = mixture-individual isomers detected
(9) Value for gross alpha excludes uranium
(10) MDL for radium 226 is 0.5; MDL for radium 228 is 1.0
(11) Where the standard is below (more stringent than) the PQL, the PQL is interpreted to be the compliance level.

(a) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR 141 and 40 CFR 143 (as of May 1990). Segment 4 MCLs are ARAR; Segment 5 MCLs are TBC; all MCLGs are TBC.
(b) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR Parts 141, 142 and 143, Final Rule, effective July 30, 1992 (56 Federal Register 3526; 1/30/1991).
(c) EPA, Quality Criteria for Protection of Aquatic Life, 1986
(d) EPA, National Ambient Water Quality Criteria for Selenium - 1987
(e) EPA National Primary and Secondary Drinking Water Regulations, 40 CFR Parts 141, 142, and 143, Final Rule (56 FR 30266; 7/1/1991) effective 1/1/1993.
(f) EPA Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper, 40 CFR 141 and 142 (56 FR 26460; 6/7/1991) effective 12/7/92 and 11/6/91. Action levels effective 12/7/92; MCLGs effective 11/6/91. Action level in 10% or less of tap samples for small and medium-sized systems.
(g) EPA, National Ambient Water Quality Criteria for Chloride - 1988
(h) EPA National Primary Drinking Water Regulations, 40 CFR 141 and 142, Final Rule, Effective January 17, 1994
(i) EPA National Primary Drinking Water Regulations, 40 CFR 141, Postponement of Final Rule and Reconsideration (57 FR 22178) - no effective date established.

TABLE E-1.C
POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS
STATEWIDE AND BASIN (CDH/CWQCC)
SURFACE WATER QUALITY STANDARDS

TABLE E-1.C

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
STATEWIDE AND BASIN (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Statewide Standards (a)								Basin Standards (b)	
			Human Health Carcinogens/ Noncarcinogens (2) (8)		Aquatic Life (8)		Tables I,II,III (1) Aquatic Life (11)				Organics (7)	
Parameter	Type (5)	Method (6)	Water Supply	Water and Fish	Acute Value	Chronic Value	Acute Value (2)	Chronic Value (2)	Agricultural Standard (3,12)	Domestic Water Supply (4,12)	Aquatic Life	Water Supply
Chloride	A	E325								250,000		
Cyanide (Free)	A	E335					5		200	200		
Fluoride	A	E340								2,000		
N as Nitrate	A	E353.1							100,000	10,000		
N as Nitrate+Nitrite	A	E353.1							100,000	10,000		
N as Nitrite	A	E354.1					SS	SS	10,000	1,000		
Sulfate	A	E375.4								250,000		
Sulfide, H2S Undissociated	A	E376.1						2		50		
Coliform (Fecal)	B	SM9221 C								2000/100 ml		
Ammonia, Total	C	E350					TVS	60		500		
Dioxin	D	(6)	0.00000022	0.000000013	0.01	0.00001						
Boron	E	SW6010(6B)							750			
Chlorine, Total Residual	E	SM4500					19	11				
Sulfur	E											
Dissolved Oxygen	FP	SM4500					>5,000	>5,000	>3,000	>3,000		
pH (Standard Units)	FP	E150.1					6.5-9.0	6.5-9.0		5.0-9.0		
Specific Conductance	FP	E120.1										
Temperature (Degrees Celsius)	FP						30 degrees	30 degrees				
Alkalinity	IN	E310.1										
Asbestos	IN											
Total Dissolved Solids	IN	E160.1										
Total Organic Carbon	IN	E415.1										
Aluminum	M	(6)					750	87				
Antimony	M	(6)								14		
Arsenic	M	(6)					360	150	100	50		
Arsenic III	M											
Arsenic V	M											
Barium	M	(6)								1,000		
Beryllium	M	(6)							100	0.0076		
Cadmium	M	(6)					TVS	TVS	10	10		
Calcium	M	(6)										
Cesium	M	(6)										
Chromium	M	(6)										
Chromium III	M						TVS	TVS	100	50		
Chromium VI	M	E218.5					16	11	100	50		
Cobalt	M	(6)										
Copper	M	(6)					TVS	TVS	200	1,000		
Iron	M	(6)						1,000 (Trec)		300 (dis)		
Lead	M	(6)					TVS	TVS	100	50		
Lithium	M	(6)										
Magnesium	M	(6)										
Manganese	M	(6)						1,000	200	50 (dis)		
Mercury	M	(6)					2.4	0.1		2.0		
Molybdenum	M	(6)										
Nickel	M	(6)					TVS	TVS	200			
Potassium	M	(6)										
Selenium	M	(6)					135	17	20	10		
Silver	M	(6)					TVS	TVS		50		
Sodium	M	(6)										
Strontium	M	(6)										
Thallium	M	(6)						15		0.012		
Tin	M	(6)										
Titanium	M	SW6010 (6B)										
Tungsten	M	SW6010 (6B)										
Vanadium	M	(6)										
Zinc	M	(6)					TVS	TVS	2,000	5,000		

TABLE E-1.C (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
STATEWIDE AND BASIN (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Statewide Standards (a)								Basin Standards (b)	
			Human Health Carcinogens/ Noncarcinogens (2) (8)		Aquatic Life (8)		Tables I,II,III (1) Aquatic Life (11)				Organics (7)	
Parameter	Type (5)	Method (6)	Water Supply	Water and Fish	Acute Value	Chronic Value	Acute Value (2)	Chronic Value (2)	Agricultural Standard (3,12)	Domestic Water Supply (4,12)	Aquatic Life	Water Supply
Aldicarb	P		10									
Aldicarb Sulfone	P											
Aldicarb Sulfoxide	P											
Aldrin	P	(6)	0.002 (8)	0.00013	1.5						<0.003	
Aldrin & Dieldrin combined	P	(6)									<0.003	
Carbofuran	P	(6C)	36									
Chloranil	P											
Chlordane	P	(6)	0.03 (8)		1.2	0.0043						
Chlorpylfos	P	(6)			0.083	0.041						
DDT	P	(6)	0.1	0.00059	0.55	0.001					0.001	
DDT Metabolite (DDD)	P	(6)		0.00083	0.6						0.001	
DDT Metabolite (DDE)	P	(6)	0.1	0.00059	1,050						0.001	
Demeton	P	(6)				0.1					0.1	
Diazinon	P	(6)										
Dieldrin	P	(6)	0.002	0.00014	1.3	0.0019					<0.003	
Endosulfan I	P	(6)		0.93	0.11	0.056					0.003	
Endosulfan II	P	(6)										
Endosulfan Sulfate	P	(6)		0.93								
Endrin	P	(6)	0.2		0.09	0.0023					0.004	
Endrin Aldehyde	P	(6B)	0.2	0.2								
Endrin Ketone	P	(6B)										
Guthion (Azinphos methyl)	P	(6)				0.01					0.01	
Heptachlor	P	(6)	0.008	0.00021	0.26	0.0038					0.001	0.2
Heptachlor Epoxide	P	(6)	0.09	0.0001	0.26	0.0038						
Hexachlorocyclohexane, Alpha	P	(6)	0.006		0.0039							
Hexachlorocyclohexane, Beta	P	(6)		0.014								
Hexachlorocyclohexane (HCH or BHC)	P				100							
Hexachlorocyclohexane, Delta	P	(6)										
Hexachlorocyclohexane, Technical (Total)	P	(6E)		0.012								
Hexachlorocyclohexane, Gamma (Lindane)	P	(6)	0.2	0.019	1.0	0.08					0.01	4
Malathion	P	(6B)				0.1					0.1	
Methoxychlor	P	(6)	40			0.03					0.03	100
Mirex	P					0.001					0.001	
Oxamyl (Vydate)	P											
Parathion	P	(6B)									0.04	100
Toxaphene	P	(6)	0.03	0.00073	0.73	0.0002					0.005	5
Vaponite 2	P											
Aroclor 1016	PP	(6)										
Aroclor 1221	PP	(6)										
Aroclor 1232	PP	(6)										
Aroclor 1242	PP	(6)										
Aroclor 1248	PP	(6)										
Aroclor 1254	PP	(6)										
Aroclor 1260	PP	(6)										
PCBs (Total)	PP	(6)	0.005	0.000044	2.0	0.014					0.001	
2,4,5-TP Silvex	H	(6C)	50									
2,4-D	H	(6C)	70									100
Acrolein	H			320	68	21						
Atrazine	H	(6D)										
Bromacil	H											
Dalapon	H	(6)										
Dinoseb	H	(6)										
Diquat	H											
Endothall	H											
Glyphosate	H											
Picloram	H											
Simazine	H	(6D)										

TABLE E-1.C (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
STATEWIDE AND BASIN (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Statewide Standards (a)								Basin Standards (b)	
			Human Health Carcinogens/ Noncarcinogens (2) (8)		Aquatic Life (8)		Tables I,II,III (1) Aquatic Life (11)				Organics (7)	
Parameter	Type (5)	Method (6)	Water Supply	Water and Fish	Acute Value	Chronic Value	Acute Value (2)	Chronic Value (2)	Agricultural Standard (3,12)	Domestic Water Supply (4,12)	Aquatic Life	Water Supply
Americium (Total) (pCi/l)	R											
Americium 241 (pCi/l)	R											
Cesium 134 (pCi/l)	R		80 (10)									
Cesium 137 (pCi/l)	R											
Gross Alpha (pCi/l)	R											
Gross Beta (pCi/l)	R											
Plutonium (Total) (pCi/l)	R											
Plutonium 238+239+240 (pCi/l)	R		15 (10)									
Radium 226+228 (pCi/l)	R	(9)	5 (10)									
Strontium 89+90 (pCi/l)	R											
Strontium 90 (pCi/l)	R		8 (10)									
Thorium 230+232 (pCi/l)	R		60 (10)									
Tritium (pCi/l)	R		20,000 (10)									
Uranium 233+234 (pCi/l)	R											
Uranium 235 (pCi/l)	R											
Uranium 238 (pCi/l)	R											
Uranium (Total) (pCi/l)	R						TVS	TVS				
1,2,4,5-Tetrachlorobenzene	SV	(6B)	2 (8)									
1,2,4-Trichlorobenzene	SV	(6)										
1,2-Dichlorobenzene (Ortho)	SV	(6)	620	620								
1,2-Diphenylhydrazine	SV	(6B)	0.05	0.04	270							
1,3-Dichlorobenzene (Meta)	SV	(6)	620	400								
1,4-Dichlorobenzene (Para)	SV	(6)	75	75								
2,4,5-Trichlorophenol	SV	(6)										
2,4,6-Trichlorophenol	SV	(6)	2	2		970						
2,4-Dichlorophenol	SV	(6)	21	21	2,020	365						
2,4-Dimethylphenol	SV	(6)			2,120							
2,4-Dinitrophenol	SV	(6)	14	14								
2,4-Dinitrotoluene	SV	(6)		0.11								
2,6-Dinitrotoluene	SV	(6)			330	230						
2-Chloronaphthalene	SV	(6)										
2-Chlorophenol	SV	(6)			4,380	2,000						
2-Methylnaphthalene	SV	(6)										
2-Methylphenol	SV	(6)										
2-Nitroaniline	SV	(6)										
2-Nitrophenol	SV	(6)										
Dichlorobenzidine (Total)	SV	(6)		0.039								
3-Nitroaniline	SV	(6)										
4,6-Dinitro-2-methylphenol	SV	(6)		13								
4-Bromophenyl-phenyl-ether	SV	(6)										
4-Chloroaniline	SV	(6)										
4-Chlorophenyl-phenyl-ether	SV	(6)										
4-Chloro-3-methylphenol	SV	(6)			30							
4-Methylphenol	SV	(6)										
4-Nitroaniline	SV	(6)										
4-Nitrophenol	SV	(6)										
Acenaphthene	SV	(6)			1,700	520						
Anthracene	SV	(6)		0.0028								
Benzidine	SV	(6B,C)	0.0002	0.00012(8)	2,500						0.1	0.01
Benzoic Acid	SV	(6)										
Benzo(a)anthracene	SV	(6)		0.0028								
Benzo(a)pyrene	SV	(6)		0.0028								
Benzo(b)fluoranthene	SV	(6)		0.0028								
Benzo(g,h,i)perylene	SV	(6)		0.0028								
Benzo(k)fluoranthene	SV	(6)		0.0028								
Benzyl Alcohol	SV	(6)										
bis(2-Chloroethoxy)methane	SV	(6)										
bis(2-Chloroethyl)ether	SV	(6)	0.03 (8)	0.03 (8)								
bis(2-Chloroisopropyl)ether	SV	(6)		1,400								
bis(2-Ethylhexyl)phthalate (Di(2-ethylhexyl)phthalate)	SV	(6)		1.8 (8)								

TABLE E-1.C (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
STATEWIDE AND BASIN (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Statewide Standards (a)								Basin Standards (b)	
			Human Health Carcinogens/ Noncarcinogens (2) (8)		Aquatic Life (8)		Tables I,II,III (1) Aquatic Life (11)				Organics (7)	
Parameter	Type (5)	Method (6)	Water Supply	Water and Fish	Acute Value	Chronic Value	Acute Value (2)	Chronic Value (2)	Agricultural Standard (3,12)	Domestic Water Supply (4,12)	Aquatic Life	Water Supply
Butadiene	SV											
Butylbenzylphthalate	SV	(6)		3,000								
Chlorinated Ethers	SV	(6)										
Chlorinated Napthalenes	SV	(6)										
Chloroalkylethers	SV	(6)										
Chlorophenol (Total)	SV	(6)									1	1
Chrysene	SV	(6)		0.0028								
Dibenzofuran	SV	(6)										
Dibenz(a,h)anthracene	SV	(6)		0.0028								
Dichlorobenzenes	SV	(6)										
Diethylphthalate	SV	(6)		23,000								
Di(2-ethylhexyl)adipate	SV	(6)										
Dimethylphthalate	SV	(6)		313,000								
Di-n-butylphthalate	SV	(6)		2,700								
Di-n-octylphthalate	SV	(6)										
Ethylene Glycol	SV	(6C)										
Fluoranthene	SV	(6)		42	3,980							
Fluorene	SV	(6)		0.0028								
Formaldehyde	SV											
Haloethers	SV	(6)										
Hexachlorobenzene	SV	(6)	6	0.00072								
Hexachlorobutadiene	SV	(6)	1	0.45	90	9.3						
Hexachlorocyclopentadiene	SV	(6)		240	7	5						
Hexachloroethane	SV	(6)		1.9	980	540						
Hydrazine	SV											
Indeno(1,2,3-cd)pyrene	SV	(6)		0.0028								
Isophorone	SV	(6)	1,050	8.4	117,000							
Naphthalene	SV	(6)		0.0028	2,300	620						
Nitrobenzene	SV	(6)	3.5	3.5	27,000							
Nitrophenols	SV	(6)										
Nitrosamines	SV	(6)										
N-Nitrosodibutylamine	SV	(6B)		0.0064								
N-Nitrosodiethylamine	SV	(6B)		0.0008								
N-Nitrosodimethylamine	SV	(6B)		0.00069								
N-Nitrosopyrrolidine	SV	(6B)		0.016								
N-Nitrosodiphenylamine	SV	(6B)		4.9								
N-Nitroso-di-n-propylamine	SV	(6B)		0.005								
Pentachlorinated Ethanes	SV	(6B)										
Pentachlorobenzene	SV	(6B)	6 (8)									
Pentachlorophenol	SV	(6)	200		9	5.7						
Phenanthrene	SV	(6)		0.0028								
Phenol	SV	(6)		21,000	10,200	2,560					500	1
Phthalate Esters	SV	(6)										
Polynuclear Aromatic Hydrocarbons	SV	(6)		0.0028								
Pyrene	SV	(6)		0.0028								
Vinyl Chloride	V	(6)	2	2								
1,1,1-Trichloroethane	V	(6)	200	200								
1,1,2,2-Tetrachloroethane	V	(6)		0.17		2,400						
1,1,2-Trichloroethane	V	(6)	3	0.6	9,400							
1,1-Dichloroethane	V	(6)										
1,1-Dichloroethene	V	(6)	7	0.057								
1,2-Dichloroethane	V	(6)	0.4	0.4	118,000	20,000						
1,2-Dichloroethene (cis)	V	(6)	70									
1,2-Dichloroethene (total)	V	(6)										
1,2-Dichloroethene (trans)	V	(6)	100									
1,2-Dichloropropane	V	(6)	0.56 (8)	0.56	23,000	5,700						
1,3-Dichloropropene (cis)	V	(6)		10	6,060	244						
1,3-Dichloropropene (trans)	V	(6)		10	6,060	244						
2-Butanone	V	(6)										
2-Hexanone	V	(6)										

TABLE E-1.C (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
STATEWIDE AND BASIN (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Statewide Standards (a)								Basin Standards (b)	
			Human Health Carcinogens/ Noncarcinogens (2) (8)		Aquatic Life (8)		Tables I,II,III (1)				Organics (7)	
							Aquatic Life (11)					
Parameter	Type (5)	Method (6)	Water Supply	Water and Fish	Acute Value	Chronic Value	Acute Value (2)	Chronic Value (2)	Agricultural Standard (3,12)	Domestic Water Supply (4,12)	Aquatic Life	Water Supply
4-Methyl-2-pentanone	V	(6)										
Acetone	V	(6)										
Acrylonitrile	V	(6)		0.058	7,500	2,600						
Benzene	V	(6)	1	1	5,300							
Bromodichloromethane	V	(6)	0.3	0.3								
Bromoform	V	(6)	4	4								
Bromomethane	V	(6)		48								
Carbon Disulfide	V	(6)										
Carbon Tetrachloride	V	(6)	0.3	0.25	35,200							
Chlorinated Benzenes	V/SV	(6)										
Chlorobenzene	V	(6)	100	100								
Chloroethane	V	(6)										
Chloroform	V	(6)	6	6	28,900	1,240						
Chloromethane	V	(6)		5.7								
Dibromochloromethane	V	(6)	14	6								
Dichloroethenes	V	(6)										
Ethylbenzene	V	(6)	680	3,100	32,000							
Ethylene Dibromide	V	(6C)										
Ethylene Oxide	V											
Halomethanes	V	(6)										
Methylene Chloride	V	(6)		4.7								
Styrene	V	(6)										
Tetrachloroethanes	V	(6)										
Tetrachloroethene	V	(6)	5	0.8	5,280	840						
Toluene	V	(6)	1,000	1,000	17,500							
Trichloroethanes	V	(6)										
Trichloroethene	V	(6)	5	2.7	45,000	21,900						
Vinyl Acetate	V	(6)										
Xylenes (Total)	V	(6)										

TABLE E-1.C (continued)

EXPLANATION OF TABLE

ARAR	= Applicable or Relevant and Appropriate Requirements
CDH	= Colorado Department of Health
dis	= dissolved
EPA	= Environmental Protection Agency
pCi/l	= picocuries per liter
PCB	= polychlorinated biphenyl
SS	= species specific
SW	= Solid Waste
TIC	= Tentatively Identified Compound
Trec	= Total recoverable
TVS	= Table Value Standard (hardness dependent), see Table III in (a)
ug/l	= micrograms per liter
WQCC	= Water Quality Control Commission

(1) Table I = physical and biological parameters
Table II = inorganic parameters
Table III = metal parameters
Values in Tables I, II, and III for recreational uses and cold water biota are not included.
(2) N/A - Endnote deleted.

(3) All are 30-day values except for nitrate, nitrite, and cyanide.
(4) Ammonia, sulfide, chloride, sulfate, copper, iron, manganese, antimony, beryllium, selenium, thallium, and zinc are 30-day standards, all others are 1-day standards
(5) type abbreviations are: A=anion; B=bacteria; C=cation; IN=inorganic; FP=field parameter; H=herbicide; M=metal; P= pesticide; PP=pesticide/PCB; R=radionuclide; SV=semi-volatile; V=volatile
(6) See Attachment 1 for analytical methods and corresponding detection limits
abbreviations are: *E=EPA; SW=SW846; a=detected as total; b=detected* as TICs or with method modifications; c=not routinely monitored; d=monitored in discharge ponds; e=mixture-individual isomers detected
(7) Basic Standards for Organic Chemicals (reference a) apply as stream standards where none are listed in Table 1A (reference b). See section 3.8.5(2)(f).
In the absence of specific numeric standards for non-naturally occurring organics, the narrative standard "free from toxics" (section 3.1.11(1)(d)) shall be interpreted and applied in accordance with the provisions of section 3.12.7(1)(c)(

(8) Where the standard is below (more stringent than) the PQL, the PQL is interpreted to be the compliance level.
(9) MDL for Radium 226 is 0.5; MDL for Radium 228 is 1.0
(10) These parameters are to be maintained at the lowest practical level; See section 3.1.11(2) in (a)
(11) Metals for aquatic life use are stated as dissolved unless otherwise specified.
(12) Metals for agricultural and domestic use are stated as total recoverable unless otherwise specified.

TABLE E-1.D
POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS
STREAM SEGMENT (CDH/CWQCC)
SURFACE WATER QUALITY STANDARDS

TABLE E-1.D

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
STREAM SEGMENT (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Segment 4 & 5 Stream Classification and Water Quality Standards (b) (2)			
			Stream Segment Table (7)		Table 2 Radionuclides (6)	
Parameter	Type (4)	Method (3)	Acute Value	Chronic Value	Woman Creek	Walnut Creek
Chloride	A	E325		250,000		
Cyanide (Free)	A	E335		5		
Fluoride	A	E340				
N as Nitrate	A	E353.1		10,000		
N as Nitrate+Nitrite	A	E353.1				
N as Nitrite	A	E354.1		500		
Sulfate	A	E375.4		250,000		
Sulfide, H2S Undissociated	A	E376.1		2		
Coliform (Fecal)	B	SM9221C		2,000/100ml		
Ammonia as N	C	E350	TVS	100		
Dioxin	D	(3)		0.000000013		
Boron	E	SW6010(3B)		750		
Chlorine, Total Residual	E	SM4500	19	11		
Sulfur	E			2		
Dissolved Oxygen	FP	SM4500	>5,000	>5,000		
pH (Standard Units)	FP	E150.1	6.5-9	6.5-9		
Specific Conductance	FP	E120.1				
Temperature (Degrees Celsius)	FP					
inity	IN	E310.1				
estos	IN					
Total Dissolved Solids	IN	E160.1				
Total Organic Carbon	IN	E415.1				
Aluminum	M	(3)				
Antimony	M	(3)				
Arsenic (Total Recoverable)	M	(3)	50			
Arsenic III	M					
Arsenic V	M					
Barium	M	(3)				
Beryllium	M	(3)	4			
Cadmium	M	(3)	TVS	TVS		
Calcium	M	(3)				
Cesium	M	(3)				
Chromium	M	(3)				
Chromium III (Total Recoverable)	M		50			
Chromium VI	M	E218.5	16	11		
Cobalt	M	(3)				
Copper	M	(3)	TVS	TVS		
Iron (Dissolved)	M	(3)	300	50		
Iron (Trec)	M	(3)	1,000	1,000		
Lead	M	(3)	TVS	TVS		
Lithium	M	(3)				
Magnesium	M	(3)				
Manganese (Dissolved)	M	(3)	300	50		
Manganese (Trec)	M	(3)	1,000	1,000		
Mercury	M	(3)		0.01 (Total)		
Molybdenum	M	(3)				
Nickel	M	(3)	TVS	TVS		
Potassium	M	(3)				
Selenium (Total Recoverable)	M	(3)	10			
er	M	(3)	TVS	TVS		
um	M	(3)				
ntium	M	(3)				
Thallium	M	(3)				
Tin	M	(3)				
Titanium	M	SW6010(3B)				
Tungsten	M	SW6010(3B)				
Vanadium	M	(3)				

TABLE E-1.D (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
STREAM SEGMENT (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Segment 4 & 5 Stream Classification and Water Quality Standards (b) (2)			
			Stream Segment Table (7)		Table 2 Radionuclides (6)	
Parameter	Type (4)	Method (3)	Acute Value	Chronic Value	Woman Creek	Walnut Creek
Americium 241 (pCi/l)	R					
Cesium 134 (pCi/l)	R				80	80
Cesium 137 (pCi/l)	R					
Gross Alpha (pCi/l)	R				7	11
Gross Beta (pCi/l)	R				5	19
Plutonium (Total) (pCi/l)	R				0.05	0.05
Plutonium 238+239+240 (pCi/l)	R				15(a)	15(a)
Radium 226+228 (pCi/l)	R	(5)			5(a)	5(a)
Strontium 89+90 (pCi/l)	R					
Strontium 90 (pCi/l)	R				8	8
Thorium 230+232 (pCi/l)	R				60(a)	60(a)
Tritium (pCi/l)	R				500	500
Uranium 233+234 (pCi/l)	R					
Uranium 235 (pCi/l)	R					
Uranium 238 (pCi/l)	R					
Uranium (Total) (pCi/l)	R				5	10
1,2,4,5-Tetrachlorobenzene	SV	(3B)				
1,2,4-Trichlorobenzene	SV	(3)				
1,2-Dichlorobenzene (Ortho)	SV	(3)				
1,2-Diphenylhydrazine	SV	(3B)				
3-Dichlorobenzene (Meta)	SV	(3)				
Dichlorobenzene (Para)	SV	(3)				
,5-Trichlorophenol	SV	(3)				
2,4,6-Trichlorophenol	SV	(3)		1.2		
2,4-Dichlorophenol	SV	(3)				
2,4-Dimethylphenol	SV	(3)				
2,4-Dinitrophenol	SV	(3)				
2,4-Dinitrotoluene	SV	(3)				
2,6-Dinitrotoluene	SV	(3)				
2-Chloronaphthalene	SV	(3)				
2-Chlorophenol	SV	(3)				
2-Methylnaphthalene	SV	(3)				
2-Methylphenol	SV	(3)				
2-Nitroaniline	SV	(3)				
2-Nitrophenol	SV	(3)				
3-Nitroaniline	SV	(3)				
4,6-Dinitro-2-methylphenol	SV	(3)				
4-Bromophenyl-phenyl-ether	SV	(3)				
4-Chloroaniline	SV	(3)				
4-Chlorophenyl-phenyl-ether	SV	(3)				
4-Chloro-3-methylphenol	SV	(3)				
4-Methylphenol	SV	(3)				
4-Nitroaniline	SV	(3)				
4-Nitrophenol	SV	(3)				
Acenaphthene	SV	(3)				
Anthracene	SV	(3)				
Benzidine	SV	(3B,C)		0.00012		
Benzoic Acid	SV	(3)				
Benzo(a)anthracene	SV	(3)				
Benzo(a)pyrene	SV	(3)				
Benzo(b)fluoranthene	SV	(3)				
Benzo(g,h,i)perylene	SV	(3)				
Benzo(k)fluoranthene	SV	(3)				
Benzyl Alcohol	SV	(3)				
(2-Chloroethoxy)methane	SV	(3)				
2-Chloroethyl)ether	SV	(3)		0.0000037		
(Chloromethyl)ether	SV					
bis(2-Chloroisopropyl)ether	SV	(3)				
bis(2-Ethylhexyl)phthalate (Di(2-ethylhexyl)p	SV	(3)				
Butadiene	SV					
Butyl Benzylphthalate	SV	(3)				

TABLE E-1.D (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
STREAM SEGMENT (CDH/WQCC) SURFACE WATER QUALITY STANDARDS
ALL VALUES ARE REPORTED IN ug/l UNLESS OTHERWISE NOTED

			Segment 4 & 5 Stream Classification and Water Quality Standards (b) (2)			
			Stream Segment Table (7)		Table 2 Radionuclides (6)	
Parameter	Type (4)	Method (3)	Acute Value	Chronic Value	Woman Creek	Walnut Creek
Acrylonitrile	V	(3)		0.058		
Benzene	V	(3)				
Bromodichloromethane	V	(3)				
Bromoform	V	(3)				
Bromomethane	V	(3)				
Carbon Disulfide	V	(3)				
Carbon Tetrachloride	V	(3)				
Chlorinated Benzenes	V/SV	(3)				
Chlorobenzene	V	(3)				
Chloroethane	V	(3)				
Chloroform	V	(3)		0.19		
Chloromethane	V	(3)				
Dibromochloromethane	V	(3)				
Dichloroethenes	V	(3)				
Ethylbenzene	V	(3)				
Ethylene Dibromide	V	(3C)				
Ethylene Oxide	V					
Halomethanes	V	(3)		0.19		
Methylene Chloride	V	(3)				
Styrene	V	(3)				
Tetrachloroethanes	V	(3)		0.8		
1,2,2-Tetrachloroethene	V	(3)				
...ene	V	(3)				
...hloroethanes	V	(3)				
,1,1-Trichloroethene	V	(3)				
Vinyl Acetate	V	(3)				
Xylenes (Total)	V	(3)				

TABLE E-1.E
POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS
SOIL CONTAMINANT CRITERIA

TABLE E-1.E

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
SOIL CONTAMINANT CRITERIA
ALL VALUES ARE IN mg/Kg UNLESS OTHERWISE NOTED

			FEDERAL BENCHMARKS (a) Maximum allowed Concentration		STATE BENCHMARKS (b) Maximum allowed Concentration	
Parameter	Type (1)	Method (2)	SOLIDS (PPM)	LIQUIDS (mg/l)	SOLIDS (PPM)	LIQUIDS (mg/l)
Chloride	A	E325				
Cyanide (Free)	A	E335	4.416 E+0	4.416 E+0		
Fluoride	A	E340				
N as Nitrate	A	E353.1				
N as Nitrate+Nitrite	A	E353.1				
N as Nitrite	A	E354.1				
Sulfate	A	E375.4				
Sulfide, H2S Undissociated	A	E376.1				
Coliform (Fecal)	B	SM9221C				
Ammonia as N	C	E350				
Dioxin	D	(2)				
Boron	E	SW6010(2B)				
Chlorine, Total Residual	E	SM4500				
Sulfur	E					
Dissolved Oxygen	FP	SM4500				
pH (Standard Units)	FP	E150.1				
Specific Conductance	FP	E120.1				
Temperature (Degrees Celsius)	FP					
...linity	IN	E310.1				
...bestos	IN					
Total Dissolved Solids	IN	E160.1				
Total Organic Carbon	IN	E415.1				
Aluminum	M	(2)				
Antimony	M	(2)	6.309 E-02	6.309 E-02		
Arsenic	M	(2)	3.155 E-01	3.155 E-01		
Arsenic III	M					
Arsenic V	M					
Barium	M	(2)	6.309 E+0	6.309 E+0		
Beryllium	M	(2)				
Cadmium	M	(2)	6.309 E-02	6.309 E-02		
Calcium	M	(2)				
Cesium	M	(2)				
Chromium	M	(2)	3.155 E-01	3.155 E-01		
Chromium III	M					
Chromium VI	M	E218.5				
Cobalt	M	(2)				
Copper	M	(2)				
Iron	M	(2)				
Lead	M	(2)	j	j		
Lithium	M	(2)				
Magnesium	M	(2)				
Manganese	M	(2)				
Mercury	M	(2)	1.262 E-02	1.262 E-02		
Molybdenum	M	(2)				
Nickel	M	(2)	j	j		
Potassium	M	(2)				
Selenium	M	(2)	6.309 E-02	6.309 E-02		
Silver	M	(2)	3.155 E-01	3.155 E-01		
Sodium	M	(2)				
...tium	M	(2)				
...ium	M	(2)	1.893 E-02	1.893 E-02		
[illegible]	M	(2)				
Titanium	M	SW6010(2B)				
Tungsten	M	SW6010(2B)				
Vanadium	M	(2)				
Zinc	M	(2)				

TABLE E-1.E (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
SOIL CONTAMINANT CRITERIA
ALL VALUES ARE IN mg/Kg UNLESS OTHERWISE NOTED

			FEDERAL BENCHMARKS (a) Maximum allowed Concentration		STATE BENCHMARKS (b) Maximum allowed Concentration	
Parameter	Type (1)	Method (2)	SOLIDS (PPM)	LIQUIDS (mg/l)	SOLIDS (PPM)	LIQUIDS (mg/l)
Aldicarb	P		1.253 E+0	6.309 E-02		
Aldicarb Sulfone	P					
Aldicarb Sulfoxide	P					
Aldrin	P	(2)	1.351 E-03	1.262 E-05		
Carbofuran	P	(2C)				
Chloranil	P					
Chlordane	P	(2)	1.944 E+01	1.262 E-02		
Chlorpyrifos	P	(2)				
DDT	P	(2)	3.109 E+0	6.309 E-04		
DDT Metabolite (DDD)	P	(2)	5.982 E-02	6.309 E-04		
DDT Metabolite (DDE)	P	(2)	9.902 E-01	6.309 E-04		
Demeton	P	(2)				
Diazinon	P	(2)				
Dieldrin	P	(2)	1.292 E-03	1.262 E-05		
Endosulfan I	P	(2)				
Endosulfan II	P	(2)				
Endosulfan sulfate	P	(2)				
Endrin	P	(2)	1.004 E+0	1.262 E-03		
Endrin Aldehyde	P	(2B)				
Endrin Ketone	P	(2B)				
Guthion (Azinphos methyl)	P	(2)				
Heptachlor	P	(2)	3.345 E+0	2.524 E-03		
Heptachlor Epoxide	P	(2)	8.346 E-01	1.262 E-03		
Hexachlorocyclohexane, Alpha	P	(2)				
Hexachlorocyclohexane, Beta	P	(2)				
Hexachlorocyclohexane (HCH or BHC)	P					
Hexachlorocyclohexane, Delta	P	(2)				
Hexachlorocyclohexane, Technical (Total)	P	(2E)				
Hexachlorocyclohexane, Gamma (Lindane)	P	(2)				
Malathion	P	(2B)				
Methoxychlor	P	(2)	2.633 E+04	6.309 E-01		
Mirex	P					
Oxamyl (Vydate)	P					
Parathion	P	(2B)				
Toxaphene	P	(2)	7.909 E+01	3.155 E-02		
Vaponite 2	P					
Aroclor 1016	PP	(2)				
Aroclor 1221	PP	(2)				
Aroclor 1232	PP	(2)				
Aroclor 1242	PP	(2)				
Aroclor 1248	PP	(2)				
Aroclor 1254	PP	(2)				
Aroclor 1260	PP	(2)				
PCBs (Total)	PP	(2)	1.223 E+01	3.155 E-03		
2,4,5-TP Silvex	H	(2C)	9.905 E+0	6.309 E-02		
2,4-Dichlorophenoxyacetic Acid(2,4-D)	H	(2C)	1.069 E+02	6.309 E-04		
Acrolein	H		1.181 E+0	3.15 E+0		
Atrazine	H	(2D)				
Bromacil	H					
Dalapon	H	(2)				
Dinoseb	H	(2)				
Diquat	H					
Endothall	H					
Glyphosate	H					
Picloram	H					
Simazine	H	(2D)				
Americium (Total) (pCi/l)	R					

TABLE E-1.E (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
SOIL CONTAMINANT CRITERIA
ALL VALUES ARE IN mg/Kg UNLESS OTHERWISE NOTED

			FEDERAL BENCHMARKS (a)		STATE BENCHMARKS (b)	
			Maximum allowed Concentration		Maximum allowed Concentration	
Parameter	Type (1)	Method (2)	SOLIDS (PPM)	LIQUIDS (mg/l)	SOLIDS (PPM)	LIQUIDS (mg/l)
Americium 241 (pCi/l)	R					
Cesium 134 (pCi/l)	R					
Cesium 137 (pCi/l)	R					
Gross Alpha (pCi/l)	R				5.0 pCi/g	
Gross Beta (pCi/l)	R				50.0 pCi/g	
Plutonium (Total) (pCi/l)	R					
Plutonium 238+239+240 (pCi/l)	R				0.9 pCi/g	
Radium 226+228 (pCi/l)	R					
Strontium 89+90 (pCi/l)	R					
Strontium 90 (pCi/l)	R					
Thorium 230+232 (pCi/l)	R					
Tritium (pCi/l)	R					
Uranium 233+234 (pCi/l)	R					
Uranium 235 (pCi/l)	R					
Uranium 238 (pCi/l)	R					
Uranium (Total)(pCi/l)	R					
1,2,4,5-Tetrachlorobenzene	SV	(2B)	5.603 E+01	6.309 E-02		
1,2,4-Trichlorobenzene	SV	(2)	1.217 E+04	4.4165 E+0		
1,2-Dichlorobenzene (Ortho)	SV	(2)	4.999 E+03	3.785 E+0		
Diphenylhydrazine	SV	(2B)	6.976 E-04	2.524 E-04		
ichlorobenzene (Meta)	SV	(2)	4.790 E+04	1.893 E+0		
Dichlorobenzene (Para)	SV	(2)	2.650 E+02	4.732 E-01		
2,4,5-Trichlorophenol	SV	(2)	2.101 E+04	2.524 E+01		
2,4,6-Trichlorophenol	SV	(2)	3.536 E-01	1.262 E-02		
2,4-Dichlorophenol	SV	(2)	4.329 E+04	6.309 E-01		
2,4-Dimethylphenol	SV	(2)	1.248 E+01	1.262 E-01		
2,4-Dinitrophenol	SV	(2)	2.296 E+01	4.416 E-04		
2,4-Dinitrotoluene	SV	(2)				
2,6-Dinitrotoluene	SV	(2)				
2-Chloronaphthalene	SV	(2)				
2-Chlorophenol	SV	(2)	4.412 E+04	1.262 E+0		
2-Methylnaphthalene	SV	(2)				
2-Methylphenol	SV	(2)				
2-Nitroaniline	SV	(2)				
2-Nitrophenol	SV	(2)				
3,3'-Dichlorobenzidine	SV	(2)	5.656 E-02	5.047 E-04		
3-Nitroaniline	SV	(2)				
4,6-Dinitro-2-methylphenol	SV	(2)				
4-Bromophenyl-phenyl-ether	SV	(2)				
4-Chloroaniline	SV	(2)				
4-Chlorophenyl-phenyl-ether	SV	(2)				
4-Chloro-3-methylphenol	SV	(2)				
4-Methylphenol	SV	(2)				
4-Nitroaniline	SV	(2)				
4-Nitrophenol	SV	(2)				
Acenaphthene	SV	(2)				
Anthracene	SV	(2)	7.701 E+01	1.262 E-02		
Benzidine	SV	(2BC)	1.262 E-06	1.262 E-06		
Benzoic Acid	SV	(2)				
Benzo(a)anthracene	SV	(2)	9.690 E-02	6.309 E-05		
Benzo(a)pyrene	SV	(2)	3.8675 E-02	1.893 E-05		
Benzo(b)fluoranthene	SV	(2)	1.643 E-04	1.262 E-04		
Benzo(g,h,i)perylene	SV	(2)				
zo(k)fluoranthene	SV	(2)	7.790 E+02	2.524 E-02		
yl Alcohol	SV	(2)				
(2-Chloroethoxy)methane	SV	(2)				
bis(2-Chloroethyl)ether	SV	(2)	1.893 E-04	1.893 E-04		
bis(Chloromethyl)ether	SV					
bis(2-Chloroisopropyl)ether	SV	(2)	2.234 E+03	6.309 E+0		
bis(2-Ethylhexyl)phthalate (Di(2-ethylhexyl)phthal	SV	(2)	4.210 E+01	1.893 E-02		

TABLE E-1.E (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
SOIL CONTAMINANT CRITERIA
ALL VALUES ARE IN mg/Kg UNLESS OTHERWISE NOTED

			FEDERAL BENCHMARKS (a) Maximum allowed Concentration		STATE BENCHMARKS (b) Maximum allowed Concentration	
Parameter	Type (1)	Method (2)	SOLIDS (PPM)	LIQUIDS (mg/l)	SOLIDS (PPM)	LIQUIDS (mg/l)
Butadiene	SV					
Butylbenzylphthalate	SV	(2)	6.375 E+04	5.678 E+0		
Chlorinated Ethers	SV	(2)				
Chlorinated Napthalenes	SV	(2)				
Chloroalkylethers	SV	(2)				
Chrysene	SV	(2)	1.516 E+01	1.262 E-03		
Dibenzofuran	SV	(2)				
Dibenz(a,h)anthracene	SV	(2)	7.318 E-03	4.416 E-06		
Dichlorobenzenes	SV	(2)				
Diethylphthalate	SV	(2)	4.795 E+05	1.893 E+02		
Di(2-ethylhexyl)adipate	SV					
Dimethylphthalate	SV	(2)	9.232 E+06	2.524 E+03		
Di-n-butylphthalate	SV	(2)				
Di-n-octylphthalate	SV	(2)	3.441 E+04	3.785 E+0		
Ethylene Glycol	SV	(2C)				
Fluoranthene	SV	(2)	2.971 E+04	1.262 E+0		
Fluorene	SV	(2)	1.048 E+01	1.262 E-02		
Formaldehyde	SV					
Haloethers	SV	(2)				
Hexachlorobenzene	SV	(2)	2.619 E-01	1.262 E-04		
Hexachlorobutadiene	SV	(2)	5.139 E+0	3.155 E-03		
Hexachlorocyclopentadiene	SV	(2)	8.283 E+03	1.262 E+0		
Hexachloroethane	SV	(2)	2.956 E+0	1.893 E-02		
Hydrazine	SV		6.309 E-05	6.309 E-05		
Indeno(1,2,3-cd)pyrene	SV	(2)	2.970 E+04	1.262 E-03		
Isophorone	SV	(2)	1.345 E+04	4.416 E+01		
Naphthalene	SV	(2)	5.738 E+05	6.309 E+01		
Nitrobenzene	SV	(2)	6.557 E+0	1.262 E-01		
Nitrophenols	SV	(2)				
Nitrosamines	SV	(2)				
N-Nitrosodibutylamine	SV	(2B)				
N-Nitrosodiethylamine	SV	(2B)				
N-Nitrosodimethylamine	SV	(2B)				
N-Nitrosopyrrolidine	SV	(2B)	1.262 E-04	1.262 E-04		
N-Nitrosodiphenylamine	SV	(2B)	6.309 E-05	6.309 E-05		
N-Nitroso-di-n-dipropylamine	SV	(2B)				
Pentachlorinated Ethanes	SV	(2B)				
Pentachlorobenzene	SV	(2B)	2.284 E+03	1.893 E-04		
Pentachlorophenol	SV	(2)	2.917 E+03	1.262 E+0		
Phenanthrene	SV	(2)	1.398 E+01	1.262 E-02		
Phenol	SV	(2)	2.051 E+04	1.262 E-02		
Phthalate Esters	SV	(2)				
Polynuclear Aromatic Hydrocarbons	SV	(2)				
Pyrene	SV	(2)	4.076 E+05	6.309 E+0		
Vinyl Chloride	V	(2)	1.822 E-01	1.262 E-02		
1,1,1-Trichloroethane	V	(2)	2.229 E+02	1.262 E+0		
1,1,2,2-Tetrachloroethane	V	(2)	5.832 E-03	1.262 E-03		
1,1,2-Trichloroethane	V	(2)	2.315 E-02	3.785 E-03		
1,1-Dichloroethane	V	(2)	1.140 E-02	2.254 E-03		
1,1-Dichloroethene	V	(2)	1.270 E+0	4.416 E-02		
1,2-Dichloroethane	V	(2)	3.717 E-01	3.155 E-02		
1,2-Dichloroethene (cis)	V	(2A)	2.973 E+01	4.416 E-7		
1,2-Dichloroethene (total)	V	(2)				
1,2-Dichloroethene (trans)	V	(2A)	3.641 E+01	6.309 E-01		
1,2-Dichloropropane	V	(2)	6.995 E-01	3.155 E-02		
1,3-Dichloropropene (cis)	V	(2)				
1,3-Dichloropropene (trans)	V	(2)				
2-Butanone	V	(2)				
2-Hexanone	V	(2)				
4-Methyl-2-pentanone	V	(2)				

TABLE E-1.E (continued)

POTENTIAL CHEMICAL-SPECIFIC BENCHMARKS (December 16, 1992)
SOIL CONTAMINANT CRITERIA
ALL VALUES ARE IN mg/Kg UNLESS OTHERWISE NOTED

			FEDERAL BENCHMARKS (a)		STATE BENCHMARKS (b)	
			Maximum allowed Concentration		Maximum allowed Concentration	
Parameter	Type (1)	Method (2)	SOLIDS (PPM)	LIQUIDS (mg/l)	SOLIDS (PPM)	LIQUIDS (mg/l)
Acetone	V	(2)	5.170 E+02	2.524 E+01		
Acrylonitrile	V	(2B)	3.785 E-04	3.785 E-04		
Benzene	V	(2)	8.879 E-01	3.156 E-02		
Bromodichloromethane	V	(2)	7.546 E+02	4.4165 E+0		
Bromoform	V	(2)				
Bromomethane	V	(2)	3.606 E+01	3.155 E-01		
Carbon Disulfide	V	(2)	1.277 E+04	2.524 E+01		
Carbon Tetrachloride	V	(2)	1.408 E+0	3.155 E-02		
Chlorinated Benzenes	V/SV	(2)				
Chlorobenzene	V	(2)	1.526 E+02	6.309 E-01		
Chloroethane	V	(2)				
Chloroform	V	(2)	4.968 E-01	3.785 E-02		
Chloromethane	V	(2)				
Dibromochloromethane	V	(2)				
Dichloroethenes	V	(2)				
Ethylbenzene	V	(2)	4.984 E+03	4.416 E+0		
Ethylene Dibromide	V	(2C)	6.078 E-04	3.155 E-04		
Ethylene Oxide	V		6.309 E-04	6.309 E-04		
Halomethanes	V	(2)				
Methylene Chloride	V	(2)				
ene	V	(2)	2.343 E+0	3.155 E-02		
achloroethanes	V	(2)				
rachloroethene	V	(2)	3.480 E+0	3.155 E-02		
Toluene	V	(2)	1.173 E+04	1.262 E+01		
Trichloroethanes	V	(2)				
Trichloroethene	V	(2)	1.146 E+0	3.155 E-02		
Vinyl Acetate	V	(2)				
Xylenes (total)	V	(2)				

TABLE E-2
COLORADO AIR QUALITY CONTROL COMMISSION STANDARDS, REGULATION 3

TABLE E-2
COLORADO AIR QUALITY CONTROL COMMISSION STANDARDS

(State of Colorado, Regulation 3)

Criteria Pollutants (NAAQS)

CO, SO_2, NO_x, Particulate Matter (TSP), O_3, Pb

TSP (Total Suspended Particulates) - Colorado SIP for Metropolitan Denver

	Primary Std	Secondary Std	
Annual	75 $\mu g/m^3$	60 $\mu g/m^3$	Annual arithmetic mean
24-Hour	260 $\mu g/m^3$	150 $\mu g/m^3$	Not exceeded more than 1x/year

SO_2 (Sulfur Dioxide) - Colorado SIP

Incremental --->	Category 1	Category 2	Category 3
Annual Arithmetic Mean	2 $\mu g/m^3$	10 $\mu g/m^3$	15 $\mu g/m^3$
24-Hour Maximum	5 $\mu g/m^3$	50 $\mu g/m^3$	100 $\mu g/m^3$
3-Hour Maximum	25 $\mu g/m^3$	300 $\mu g/m^3$	700 $\mu g/m^3$

O_3 (Ozone, Oxidant) - Colorado SIP for Metropolitan Denver

Averaging Time/Standard	1 hour	160 $\mu g/m^3$

CO (Carbon Monoxide) - Colorado SIP for Metropolitan Denver

Averaging Time/Standard	8 hour	10 $\mu g/m^3$
Averaging Time/Standard	1 hour	40 $\mu g/m^3$

NO_2 (Nitrogen Dioxide) - Colorado SIP for Metropolitan Denver

Averaging Time/Standard	Annual	100 $\mu g/m^3$

Pb (Lead) - Colorado SIP

Averaging Time/Standard	Quarter	1.5 $\mu g/m^3$

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TABLE E-2
COLORADO AIR QUALITY CONTROL COMMISSION STANDARDS

(State of Colorado, Regulation 3)

Colorado PSD (Prevention of Significant Deterioration) Requirements

Significant rate of emissions per emissions unit that would equal or exceed any of the following in tons per year (tpy); emit or potential to emit:

CO: 100 tpy
NO_x: 40 tpy ($NO + NO_2$)
SO_2: 40 tpy

Particulate Matter: 25 tpy of PM emissions (TSP)
PM-10 Emissions: 15 tpy, particulate aerodynamic diameter $\leq 10\ \mu m$

Ozone: 40 tpy of VOC (precursor for O_3)

Pb: 0.6 tpy

Fluorides: 3 tpy

H_2SO_4 mist: 7 tpy

H_2S: 10 tpy

Total reduced sulfur, including H_2S: 10 tpy
Reduced sulfur compounds, including H_2S: 10 tpy

Total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans: 3.2 grams/year, 3.5×10^{-6} tpy
 2,3,7,8 -TCDD (tetrachlorodibenzo-p-dioxin)
 Municipal waste combustor organics

Metals, measured as particulate matter: 14 Mgrams/year, 15 tpy
 Municipal waste combustor metals

Acid gases, measured as SO_2 and HCl: 36 Mgrams/year, 40 tpy
 Municipal waste combustor acid gases

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TABLE E-2
COLORADO AIR QUALITY CONTROL COMMISSION STANDARDS

(State of Colorado, Regulation 3)

Colorado PSD Requirements for Particular Pollutants

New Stationary Source Emissions or Net Emissions Increase from a Modification --> PSD

Particular pollutant emissions from a new major source or major modification, which would cause air quality impacts in any area of Colorado, less than the following amounts, not subject to BACT, monitoring and analysis requirements (Amounts at 25 ● C and at one atmosphere (1013 millibars)):

CO	8-hour average	575 $\mu g/m^3$
NO_2	Annual average	14 $\mu g/m^3$
PM-TSP	24-hour average	10 $\mu g/m^3$
PM-10	24-hour average	10 $\mu g/m^3$
SO_2	24-hour average	13 $\mu g/m^3$
Pb	3-month average	0.1 $\mu g/m^3$
Hg	24-hour average	0.25 $\mu g/m^3$
Be	24-hour average	1 ng/m^3, 0.001 $\mu g/m^3$
Fluorides	24-hour average	0.25 $\mu g/m^3$
Vinyl chloride	24-hour average	15 $\mu g/m^3$
Total reduced sulfur	1-hour average	10 $\mu g/m^3$
H_2S	1-hour average	0.2 $\mu g/m^3$
Reduced sulfur compounds	1-hour average	10 $\mu g/m^3$

TABLE E-2
COLORADO AIR QUALITY CONTROL COMMISSION STANDARDS

(State of Colorado, Regulation 3)

Ambient Air Increments Over Baseline Concentrations in Colorado

Maximum allowable increases over baseline concentrations for the following:

<u>Any Class I Area (National Parks, Wilderness and Primitive Areas)</u>:

PM - TSP	Annual geometric mean	5 $\mu g/m^3$
	24-hour maximum	10 $\mu g/m^3$
SO_2	Annual arithmetic mean	2 $\mu g/m^3$
	24-hour maximum	5 $\mu g/m^3$
	3-hour maximum	25 $\mu g/m^3$
NO_2	Annual arithmetic mean	2.5 $\mu g/m^3$

<u>Any Class II Area (Nearly Everywhere Else)</u>:

PM - TSP	Annual geometric mean	19 $\mu g/m^3$
	24-hour maximum	37 $\mu g/m^3$
SO_2	Annual arithmetic mean	20 $\mu g/m^3$
	24-hour maximum	91 $\mu g/m^3$
	3-hour maximum	512 $\mu g/m^3$
NO_2	Annual arithmetic mean	25 $\mu g/m^3$

901-004.450
(TableE2)

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TABLE E-3
POTENTIAL LOCATION - SPECIFIC BENCHMARKS

TABLE E-3
POTENTIAL LOCATION-SPECIFIC BENCHMARKS

Location	Requirement	Citation
Fault zones	RCRA regulations specify that hazardous waste treatment, storage, or disposal must not take place within 200 feet of a Holocene fault.	40 CFR 2645.18(a)
Flood plain	Any RCRA treatment, storage, or disposal facility which lies within a 100-year floodplain must be designed, constructed and operated to avoid washout.	40 CFR 264.18(b)
Siting of Hazardous Waste Disposal Sites	Outlines siting criteria for hazardous waste disposal sites.	Colorado Hazardous Waste Act, Sections 25-15-101, 203, 208, 302
Siting of Wastewater Treatment Facilities	CDH Water Quality Control Division must approve locations of wastewater treatment facilities.	Colorado Water Quality Control Act Section 25-8-202 and 25-8-702
Siting within an area where action may cause irreparable harm, loss, or destruction of significant articles	Planned actions must avoid threatening significant scientific, prehistorical, historical, or archeological data.	36 CFR Part 65, National Historic Preservation Act
..ng on or near historic property owned or controlled by Federal agency	Action to preserve historic properties; planning of action to minimize harm to National Historic Landmarks, included in or eligible for the National Register of Historic Places.	36 CFR Part 800, National Historic Preservation Act
Siting on critical habitat of endangered or threatened species	Action to conserve endangered or threatened species.	50 CFR Parts 200, 402, 33 CFR Parts 320-330
Wetlands	Actions must minimize the destruction, loss, or degradation of wetlands, as defined by Executive Order 11990, Section 7.	40 CFR Part 6, Appendix A
	Actions must not discharge dredged or fill material into wetlands without permit.	40 CFR Parts 230, 231
Area affecting stream or river	Action must protect fish or wildlife.	40 CFR 6.302

TABLE E-4
POTENTIAL ACTION - SPECIFIC BENCHMARKS

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Air Stripping	(CAA requirements to be provided.)		
Closure with No Post-closure Care (e.g., Clean Closure)	General performance standard requires elimination of need for further maintenance and control; elimination of post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products.	Applicable to land-based unit containing hazardous waste.[d] Applicable to RCRA hazardous waste (listed or characteristic) placed at site after the effective date of the requirements, or placed into another unit. Not applicable to material treated, stored, or disposed only before the effective date of the requirements, or if treated in-situ, or consolidated within area of contamination. Designed for cleanup that will not require long-term management. Designed for cleanup to health-based standards.	40 CFR 264.111
	Disposal or decontamination of equipment, structures, and soils. Removal or decontamination of all waste residues, contaminated containment system components (e.g., liners, dikes), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and management of them as hazardous waste.	May apply to surface impoundments and container or tank liners and hazardous waste residues, and to contaminated soil, including soil from dredging or soil disturbed in the course of drilling or excavation, and returned to land.	40 CFR 264.111 40 CFR 264.178 40 CFR 264.197 40 CFR 264.288(o)(1) and 40 CFR 264.258
	Meet health-based levels at unit.		40 CFR 264.259

[a]Currently on RCRA, CHA, and SDWA requirements are included. Additional action-specific requirements will be added as additional statutes are analyzed.

[b]Action alternatives from ROD keyword index, FY1986 Record of Decision Annual Report, January 1987, Hazardous Site Control Division, EPA.

Requirements have been proposed but not promulgated for air stripping, hybrid closure, gas collection and miscellaneous treatment. When these regulations are promulgated, they will be included in the matrix.

[d]Some action-specific requirements listed may be relevant and appropriate event if RCRA definitions of storage, disposal, or hazardous waste are not met, or if the waste at the site is similar to but not identifiable as a RCRA hazardous waste.

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Closure with Waste In-place	Eliminate free liquids by removal or solidification. Stabilization of remaining waste and waste residues to support cover.	Applicable to land disposal of hazardous waste. Applicable to RCRA hazardous waste (listed or characteristic) placed at site after the effective date of the requirements, or placed into another unit. Not applicable to material treated, stored, or disposed only before the effective date of the requirements, or if treated in-situ or consolidated within area of contamination.	40 CFR 264.228(a)(2) 40 CFR 264.228(a)(2) 40 CFR 264.258(b)
	Installation of final cover to provide long-term minimization of infiltration.		40 CFR 264.310
	30-year post-closure care and ground-water monitoring.[e]		40 CFR 264.310
Comprehensive Environmental Response, Compensation and Liability Act Program	Establishes basic requirements for implementation of the Superfund at DOE facilities.		DOE 5480.14
Container Storage	Containers of RCRA hazardous waste must be: • Maintained in good condition; • Compatible with hazardous waste to be stored; and • Closed during storage (except to add or remove waste). Inspect container storage areas weekly for deterioration.	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held for a temporary period greater than 90 days before treatment, disposal, or storage elsewhere (40 CFR 264.10), in a container (i.e., any portable device in which a material is stored, transported, disposed of, or handled). A generator who accumulates or stores hazardous waste on-site for 90 days or less in compliance with 40 CFR 262.34(a)(1-4) is not subject to full RCRA storage requirements. Small quantity generators are not subject to the 90-day limit (40 CFR 262.34 (c),(d), and (e)).	40 CFR 264.171 40 CFR 264.172

[e]Regional administrator may revise length of post-closure care period (40 CFR 264.117).

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Container Storage (Continued)	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10% of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.		40 CFR 264.175
	Keep containers or ignitable or reactive waste at least 50 feet from the facility's property line.		40 CFR 264.176
	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		40 CFR 264.177
	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers, liners.		40 CFR 264.178
	Storage of banned wastes must be in accordance with 40 CFR 268. When such storage occurs beyond one year, the owner/operator bears the burden of proving that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment, and disposal.		40 CFR 268.50
Construction of a New Surface Impoundment (see Closure with Waste In-place and Closure with No Post-closure Care)	<u>Minimum Technology Requirements</u>: Use two liners, a top liner that prevents waste migration into the liner and a bottom liner that prevents waste migration through the liner (throughout the post-closure period).	RCRA hazardous waste (listed or characteristic) currently being placed in a new surface impoundment, or use of replacement or lateral extension of existing landfills or surface impoundments.	40 CFR 264.220
	Design liners to prevent failure due to pressure gradients, contact with the waste, climatic conditions, and the stress of installation and daily operations.		40 CFR 264.221
	Provide a leachate collection system between the two liners.		40 CFR 264.221
	Use a leak detection system that will detect leaks at the earliest possible time.		40 CFR 264.222

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Construction of a New Surface Impoundment (see Closure with Waste In-place and Closure with No Post-closure Care) (Continued)	Groundwater Monitoring: Establish a detection monitoring program (264.98). Establish a compliance monitoring program (264.99) and corrective action monitoring program (264.100) when required by 40 CFR 264.91. All monitoring programs must meet RCRA general groundwater monitoring requirements (264.97).	Creation of a new landfill unit to treat, store, or dispose of RCRA hazardous wastes as part of a remedial action.	40 CFR 264.91-264.100
Dike Stabilization	Design and operate facility to prevent overtopping due to overfilling; wind and wave action; rainfall; run-on; malfunctions of level controllers, alarms, and other equipment; and human error.	Existing surface impoundment containing hazardous waste, or creation of a new surface impoundment.	40 CFR 264.221
	Construct dikes with sufficient strength to prevent massive failure.		40 CFR 264.221
	Inspect liners and cover systems during and after construction.		40 CFR 264.226
	Inspect weekly for proper operation and integrity of the containment devices.		40 CFR 264.226
	Remove surface impoundment from operation if the dike leaks or there is a sudden drop in liquid level.		40 CFR 264.227
	At closure, remove or decontaminate all waste residues and contaminated materials. Otherwise, free liquids must be removed, the remaining wastes stabilized, and the facility closed in the same manner as a landfill.		40 CFR 264.228
	Manage ignitable or reactive wastes so that it is protected from materials or conditions that may cause it to ignite or react.		40 CFR 264.227

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Discharge of Treatment System Effluent	Best Available Technology: Use of best available technology economically achievable is required to control toxic and non-conventional pollutants. Use of best conventional pollutant control technology is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis.	Point source discharge to waters of the United States.[f,g]	40 CFR 122.44(a)
	Water Quality Standards: Applicable Federally-approved State water quality standards must be complied with. These standards may be in addition to or more stringent than other Federal standards under the CWA.[h]		40 CFR 122.44 and State regulations approved under 40 CFR 131
	Discharge limitations must be established at more stringent levels then technology-based standards for toxic pollutants.		40 CFR 122.44(e)
	Best Management Practices: Develop and implement a Best Management Practices program to prevent the release of toxic constituents to surface waters.		40 CFR 125.100
	The Best Management Practices program must: • Establish specific procedures for the control of toxic and hazardous pollutant spills.	Discharge to waters of the U.S.	40 CFR 125.104

[f]"Waters of the U.S." is defined broadly in 40 CFR 122.2 and includes essentially any water body and wetland.

[g]Section 121 of SARA exempts on-site CERCLA activities from obtaining permits. However, the substantive requirements of a law or regulation must be met. In particular on-site discharges to surface waters are exempt from procedural NPDES permit requirements. Off-site discharges would be required to apply for and obtain an NPDES permit.

[h]Federal Water Quality Criteria (FWQC) may be relevant and appropriate depending on the designated or potential use of the water, the media affected, the purposes of the criteria, and current information. (CERCLA Section 121(d)(2)(B)(1)) FWQC he protection of aquatic life will be relevant and appropriate when environmental factors (e.g., protection of aquatic organisms) are being considered. (50 FR 30784 (July 29, 1951))3

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Discharge of Treatment System Effluent (Continued)	• Include a prediction of direction, rate of flow, and total quantity of toxic pollutants where experience indicates a reasonable potential for equipment failure. • Assure proper management of solid and hazardous waste in accordance with regulations promulgated under RCRA.		
	Monitoring Requirements: Discharge must be monitored to assure compliance. Discharge will monitor: • The mass of each pollutant • The volume of effluent • Frequency of discharge and other measurements as appropriate		40 CFR 122.41(i)
	Approved test methods for waste constituent to be monitored must be followed. Detailed requirements for analytical procedures and quality controls are provided.		40 CFR 136.1-136.4
	Sample preservation procedures, container materials, and maximum allowable holding times are prescribed.		
	Comply with additional substantive conditions such as: • Duty to mitigate any adverse effects of any discharge; and • Proper operation and maintenance of treatment system.		40 CFR 122.41(i)
Discharge of Dredge and Fill Material to Waters of the United States and Ocean Waters	The four conditions that must be satisfied before dredge and fill is an allowable alternative are: • There must be no practical alternative. • Discharge of dredged or fill material must not cause a violation of State water quality standards, violate any applicable toxic effluent standards, jeopardize an endangered species, or injure a marine sanctuary.	Capping, dike stabilization, construction of beams and levees, and disposal of contaminated soil, waste material or dredged material are examples of activities that may involve a discharge of dredged or fill material.	40 CFR 230 33 CFR 320-330

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Discharge of Dredge and Fill Material to Waters of the United States and Ocean Waters (Continued)	• No discharge shall be permitted that will cause or contribute to significant degradation of the water. • Appropriate steps to minimize adverse effects must be taken. Determine long- and short-term effects on physical, chemical, and biological components of the aquatic ecosystem.		
Dredging	Removal of all contaminated soil.	RCRA hazardous waste placed at site after the effective date of the requirements, or placed into another unit.	See Closure in this Exhibit.
	Dredging must comply with Section 10 of the Rivers and Harbors Act and U.S. Army Corps of Engineers regulations.	Dredging in navigable waters of the United States.	33 U.S.C. 403 33 CFR 320-330
rgency Plan-, Preparedness and Response for Operations	Provide coordination direction of planning, preparedness, and response to operational emergencies in which there is a potential for personal injury, destruction of property, theft, or release of toxic, radioactive, or other hazardous material which present a potential threat to health, safety, or the environment.		DOE 5500.2
Environmental Compliance Issue Coordination	Establishes DOE requirements for coordination of significant environmental compliance issues.		DOE 5400.2A
Environmental Protection Safety and Health Protection Information Reporting Requirements	Establishes requirements and procedures for reporting information having environmental protection, safety, or health significance for DOE operations.		DOE 5484.1
Excavation	Movement of excavated materials to new location and placement in or on land will trigger land disposal restrictions for the excavated waste or closure requirements for the unit in which the waste is being placed.	Materials containing RCRA hazardous wastes subject to land disposal restrictions are placed in another unit.	40 CFR 268 (Subpart D)
	Area from which materials are excavated may require cleanup to levels established by closure requirements.	RCRA hazardous waste placed at site after the effective date of the requirements.	See Closure in this Exhibit

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
General Environmental Protection Program	Establishes environmental protection program requirements, authorities, and responsibilities for DOE operations for ensuring compliance with federal and state environment protection laws and regulations, federal executive orders, and internal department policies.		DOE 5400.1
Land Treatment	Prior to land treatment, the waste must be treated to BDAT levels or meet a no migration standard.	RCRA hazardous waste being treated or placed into another unit.	See Closure in this Exhibit.
	Ensure that hazardous constituents are degraded, transformed, or immobilized within the treatment zone.		40 CFR 264.271
	Maximum depth of treatment zone must be no more than 1.5 meters (5 feet) from the initial soil surface and more than 1 meter (3 feet) above the seasonal high water table.		40 CFR 264.271
	Demonstrate that hazardous constituents for each waste can be completely degraded, transformed, or immobilized in the treatment zone.		40 CFR 264.271
	Minimize runoff of hazardous constituents.		40 CFR 264.273
	Maintain runon/runoff control and management system.		40 CFR 264.273
	Special application conditions if food-chain crops are grown in or on treatment zone.		40 CFR 264.276
	Unsaturated zone monitoring.		
	Special requirements for ignitable or reactive waste.		
	Special requirements for incompatible wastes.		40 CFR 264.282
	Special testing and location requirements for certain hazardous materials.	RCRA waste numbers F020, F021, F022, F023, F026, F027 (dioxin-containing wastes).	40 CFR 264.283

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
National Ambient Air Quality	National ambient air quality standards have been set to attain and maintain primary and secondary standards to protect public health and the environment. Requirements include a major-source permit, prevention of significant deterioration permit, non-attainable area permit, and visibility permit.	Remedial actions at Operable Unit 2 that may result in new sources of air emissions include incineration, excavation, and air stripping of contaminated groundwater.	CAA Section 109 and 40 CFR 50
National Environmental Policy Act - All New Projects	• Determination of level of documentation required • Screen, review and assess potential environmental impacts • Early submittal of an environmental checklist to NEPA compliance committee		
Operation and Maintenance	30-year post-closure care to ensure that site is maintained and monitored.	Land disposal closure.	40 CFR 264.310
Slurry Wall	Excavation of soil for construction of slurry wall may trigger land disposal restrictions.	Materials containing RCRA hazardous waste subject to land disposal restrictions are placed in another unit. (See Treatment section for LDR schedule. Also see Consolidation, Excavation sections in this Exhibit.)	
Surface Water Control	Prevent runon and control and collect runoff from a 24-hour 25-year store (waste piles, land treatment facilities, landfills).	RCRA hazardous waste treated, stored, or disposed after the effective date of the requirements.	40 CFR 264.251(c),(d) 40 CFR 264.273(c),(d) 40 CFR 264.301(c),(d)
	Prevent over-topping of surface impoundment.		40 CFR 264.221(c)
Tank Storage (On-site)	Tanks must have sufficient structural strength to ensure that they do not obilapse, rupture, or fail.	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held for a temporary period greater than 90 days before treatment, disposal, or storage elsewhere (40 CFR 264.10), in a tank (i.e., any portable device in which a material is stored, transported, disposed of, or handled). A generator who accumulates or stores hazardous waste on-site for 90 days or less in compliance with 40 CFR 262.34(a) (1-4) is not subject to full RCRA	40 CFR 264.190
	Waste must not be incompatible with the tank material unless the tank is protected by a liner or by other means.		40 CFR 264.191
	Tanks must be provided with secondary containment and controls to prevent overfilling, and sufficient freeboard maintained in open tanks to prevent overtopping by wave action or precipitation.		40 CFR 264.193-194

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Tank Storage (On-site) (Continued)	(1-4) is not subject to full RCRA storage requirements. Small quantity generators are not subject to the 90-day limit (40 CFR 262.34(c), (d), and (e)).		
	Inspect the following: overfilling control, control equipment, monitoring data, waste level (for uncovered tanks), tank condition, above-ground portions of tanks (to assess their structural integrity), and the area surrounding the tank (to identify signs of leakage).		40 CFR 264.195
	Repair any corrosion, crack, or leak.		40 CFR 264.196
	At closure, remove all hazard waste and hazardous waste residues from tanks, discharge control equipment, and discharge confinement structures.		40 CFR 264.197
	Store ignitable and reactive waste so as to prevent the waste from igniting or reacting. Ignitable or reactive wastes in covered tanks must comply with buffer zone requirements in "Flammable and Combustible Liquids Code," Tables 2-1 through 2-6 (National Fire Protection Association, 1976 or 1981).		40 CFR 264.198
	<u>Storage Prohibitions</u>: Storage of banned wastes must be in accordance with 40 CFR 268. When such storage occurs beyond one year, the owner/operator bears the burden of proving that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment and disposal.		40 CFR 268.50
Treatment (In a unit)	Design and operating standards for unit in which hazardous waste is treated. (See citations at right for design and operating requirements for specific unit.)	Treatment of hazardous waste in a unit.	40 CFR 264.190-192 (Tanks) 40 CFR 264.221 (Surface Impoundments) 40 CFR 264.251 (Waste Piles) 40 CFR 264.273 (Lan Treatment Unit) 40 CFR 264.343-345 (Incinerators)

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]	Citation
Treatment (in a unit) (Continued)			40 CFR 264.601 (Miscellaneous Treatment Units) 40 CFR 265.573 (Thermal Treatment Units)
Treatment (when Waste will be Land Disposal)	Treatment of waste subject to ban on land disposal must attain levels achievable by best demonstrated available treatment technologies (DBAT) for each hazardous constituent in each listed waste, if residual is to be land-disposed. If residual is to be further treated, initial treatment and any subsequent treatment that produces residual to be treated need not be DBAT, if it does not exceed value in constituent concentration in waste extract Table for each applicable water. (See 51 FR 40642, November 6, 1986.)	Disposal of contaminated soil and debris resulting from CERCLA response actions or RCRA corrective actions is <u>not</u> subject to land disposal prohibitions and/or treatment standards for solvents, dioxins, or California list wastes unit November 8, 1990 (and for certain first third wastes until August 8, 1990).	40 CFR 268.10 40 CFR 268.11 40 CFR 268.12 40 CFR 268.41 40 CFR 268 (Subpart D)
		All wastes listed as hazardous in 40 CFR 261 as of November 8, 1984, except for spent solvent wastes and dioxin-containing wastes, have been ranked with respect to volume and intrinsic hazards, are scheduled for land disposal prohibition and/or treatment standard determinations as follows: Solvents and dioxins — Nov 8, 1986 California list wastes — Jul 8, 1987 One-third of all ranked and hazardous wastes — Aug 8, 1988 Underground injection of solvents and dioxins and California list wastes — Aug 8, 1988 CERCLA response action and RCRA corrective action soil and debris — Nov 8, 1988 Two-thirds of all ranked and listed hazardous wastes — Jul 8, 1989 All remaining ranked and listed hazardous wastes identified by characteristic under RCRA section 3001 — May 8, 1990	51 <u>FR</u> 40641 52 <u>FR</u> 25760

TABLE E-4
POTENTIAL ACTION-SPECIFIC BENCHMARKS[a]

Actions[b]	Requirements	Prerequisites for Applicability[c,d]		Citation
Treatment (when Waste will be Land Disposal) (Continued)		Any hazardous waste or identified waste RCRA section 3001 after November 8, 1984	Within 6 months of the date of identification or listing	
Treatment (when Waste will be Land Disposal) (Continued)	BDAT standards for spent solvent wastes and dioxin-containing wastes are based on one of four technologies or combinations: for waste waters, (1) stem stripping, (2) biological treatment, or (3) carbon absorption [alone or in a combination with (1) or (2)]; and for all other wastes, (4) incineration. Any technology may be used however, if it will achieve the concentration levels specified.			40 CFR 268.30 RCRA Sections 3004 (d)(3), (e)(3) 42 U.S.C. 6924(d)(3), (e)(3)
Worker Safety	Occupational Safety and Health program for DOE contractor employees atgovernment-ownedcontractor-operated facilities.			DOE 5483.1A
	Health and Safety Plan must be submitted.			29 CFR 1910.120

TABLES E-5A AND E-5B
F039 HAZARDOUS WASTE STANDARDS
FROM 40 CFR 268.41 AND 268.43

268.41 TABLE CCWE.—CONSTITUENT CONCENTRATIONS IN WASTE EXTRACT—Continued

Waste code	Commercial chemical name	See also	Regulated hazardous constituent	CAS No. for regulated hazardous constituent	Wastewaters		Nonwastewaters	
					Concentration (mg/l)	Notes	Concentration (mg/l)	Notes
F011	NA	Table CCW in 268.43.	Cadmium	7440-43-9	NA		0.066	
			Chromium (Total)	7440-47-32	NA		5.2	
			Lead	7439-92-1	NA		0.51	
			Nickel	7440-02-0	NA		0.32	
			Silver	7440-22-4	NA		0.072	
F012	NA	Table CCW in 268.43.	Cadmium	7440-43-9	NA		0.066	
			Chromium (Total)	7440-47-32	NA		5.2	
			Lead	7439-92-1	NA		0.51	
			Nickel	7440-02-0	NA		0.32	
			Silver	7440-22-4	NA		0.072	
F019	NA	Table CCW in 268.43.	Chromium (Total)	7440-47-32	NA		5.2	
F020-F023 and F026-F028 dioxin containing wastes [8].	NA	NA	HxCDD-All Hexachloro-dibenzo-p-dioxins		<1 ppb		<1 ppb	
			HxCDF-All Hexachloro-dibenzofurans					
			PeCDD-All Pentachloro-dibenzo-p-dioxins		<1 ppb		<1 ppb	
			PeCDF-All Pentachloro-dibenzofurans					
			TCDD-All Tetrachloro-dibenzo-p-dioxins		<1 ppb		<1 ppb	
			TCDF-All Tetrachloro-dibenzofurans					
			2,4,5-Trichlorophenol		<1 ppb		<1 ppb	
			2,4,6-Trichlorophenol					
			2,3,4,6-Tetrachlorophenol		<1 ppb		<1 ppb	
			Pentachlorophenol					
				95-95-4	<1 ppb		<1 ppb	
				88-06-2	<0.05 ppm		<0.05 ppm	
				58-90-2	<0.05 ppm		<0.05 ppm	
				87-86-5	<0.01 ppm		<0.01 ppm	
F024	NA	Table CCW in 268.43.	Chromium (Total)	7440-47-32	NA		0.073	
			Lead	7439-92-1	NA		[Reserved]	
			Nickel	7440-02-0	NA		0.088	
F039	NA	Table CCW in 268.43.	Antimony	7440-36-0	NA		0.23	
			Arsenic	7440-38-2	NA		5.0	
			Barium	7440-39-3	NA		52	
			Cadmium	7440-43-9	NA		0.066	
			Chromium (Total)	7440-47-32	NA		5.2	
			Lead	7439-92-1	NA		0.51	
			Mercury	7439-97-6	NA		0.025	
			Nickel	7440-02-0	NA		0.32	
			Selenium	7782-49-2	NA		5.7	
			Silver	7440-22-4	NA		0.072	
K001	NA	Table CCW in 268.43.	Lead	7439-92-1	NA		0.51	

TABLE E-5A

F025 (Spent Filters or Aids and Desicants Subcategory).	NA	NA	Chloroform	67-66-3	0.046	(2)	6.2	(1)
			Methylene chloride	75-9-2	0.089	(2)	31	(1)
			Carbon tetrachloride					
			1,1,2-Trichloroethane	56-23-5	0.057	(2)	6.2	(1)
			Trichloroethylene					
			Vinyl chloride	79-00-5	0.054	(2)	6.2	(1)
			Hexachlorobenzene					
			Hexachlorobutadiene	79-01-6	0.054	(2)	5.6	(1)
			Hexachoroethane	75-01-4	0.27	(2)	33	(1)
				118-74-1	0.055	(2)	37	(1)
				87-68-3	0.055	(2)	28	(1)
				67-72-1	0.055	(2)	30	(1)
F039	NA	Table CCWE in 268.41	Acetone	67-64-1	0.28	(2)	160	(1)
			Acenaphthalene	208-96-8	0.059	(2)	3.4	(1)
			Acenaphthene	83-32-9	0.059	(2)	4.0	(1)
			Acetonitrile	75-05-8	0.17	(2)	NA	
			Acetophenone	96-86-2	0.010	(2)	9.7	(1)
			2-Acetylaminofluorene	53-96-3	0.059	(2)	140	(1)
			Acrolein					
			Acrylonitrile	107-02-8	0.29	(2)	NA	
			Aldrin	107-13-1	0.24	(2)	84	(1)
				309-00-2	0.021	(2)	0.066	(1)
			4-Aminobiphenyl	92-67-1	0.13	(2)	NA	
			Aniline	62-53-3	0.81	(2)	14	(1)
			Anthracene	120-12-7	0.059	(2)	4.0	(1)
			Aramite	140-57-8	0.36	(2)	NA	
			Aroclor 1016	12674-11-2	0.013	(2)	0.92	(1)
			Aroclor 1221	11104-28-2	0.014	(2)	0.92	(1)
			Aroclor 1232	11141-16-5	0.013	(2)	0.92	(1)
			Aroclor 1242	53469-21-9	0.017	(2)	0.92	(1)
			Aroclor 1248	12672-29-6	0.013	(2)	0.92	(1)
			Aroclor 1254	11097-69-1	0.014	(2)	1.8	(1)
			Aroclor 1260	11096-82-5	0.014	(2)	1.8	(1)
			alpha-BHC	319-84-6	0.00014	(2)	0.066	(1)
			beta-BHC	319-85-7	0.00014	(2)	0.066	(1)
			delta-BHC	319-86-8	0.023	(2)	0.066	(1)
			gamma-BHC	58-89-9	0.0017	(2)	0.066	(1)
			Bonzene	71-43-2	0.14	(2)	36	(1)
			Benz(a)anthracene	56-55-3	0.059	(2)	8.2	(1)
			Benzo(b)- fluoranthene	205-99-2	0.055	(2)	3.4	(1)
			Benzo(k)- fluoranthene	207-08-9	0.059	(2)	3.4	(1)
			Benzo(g,h,i)- perylene	191-24-2	0.0055	(2)	1.5	(1)
			Benzo(a)pyrene	50-32-8	0.061	(2)	8.2	(1)
			Bromodichloromethane	75-27-4	0.35	(2)	15	(1)
			Bromoform (Tribromomethane).	75-25-2	0.63	(2)	15	(1)
			Bromomethane (methyl bromide).	74-83-9	0.11	(2)	15	(1)

TABLE E-5A (continued)

268.43 TABLE CCW.—CONSTITUENT CONCENTRATIONS IN WASTES—Continued

Waste code	Commercial chemical name	See also	Regulated hazardous constituent	CAS number for regulated hazardous constituent	Wastewaters		Nonwastewaters	
					Concentration (mg/l)	Notes	Concentration (mg/kg)	Notes
			4-Bromophenyl phenyl ether.	101-55-3	0.055	(2)	15	(1)
			n-Butyl alcohol	71-36-3	5.6	(2)	2.6	(1)
			Butyl benzyl phthalate	85-68-7	0.017	(2)	7.9	(1)
			2-sec-Butyl-4,6-dinitrophenol.	88-85-7	0.066	(2)	2.5	(1)
			Carbon tetrachloride	56-23-5	0.057	(2)	5.6	(1)
			Carbon disulfide	75-15-0	0.014	(2)	NA	
			Chlordane	57-74-9	0.0033	(2)	0.13	(1)
			p-Chloroaniline	106-47-8	0.46	(2)	16	(1)
			Chlorobenzene	108-90-7	0.057	(2)	5.7	(1)
			Chlorobenzilate	510-15-6	0.10	(2)	NA	
			2-Chloro-1,3-butadiene	126-99-8	0.057	(2)	NA	
			Chlorodibromomethane	124-48-1	0.057	(2)	15	(1)
			Chloroethane	75-00-3	0.27	(2)	6.0	(1)
			bis(2-Chloroethoxy) methane.	111-91-1	0.036	(2)	7.2	(1)
			bis(2-Chloroethyl) ether	111-44-4	0.033	(2)	7.2	(1)
			Chloroform	67-66-3	0.046	(2)	5.6	(1)
			bis(2-Chloroisopropyl) ether.	39638-32-9	0.055	(2)	7.2	(1)
			p-Chloro-m-cresol	59-50-7	0.018	(2)	14	(1)
			Chloromethane (Methyl chloride).	74-87-3	0.19	(2)	33	(1)
			2-Chloronaphthalene	91-8-7	0.055	(2)	5.6	(1)
			2-Chlorophenol	95-57-8	0.044	(2)	5.7	(1)
			3-Chloropropylene	107-05-1	0.036	(2)	28	(1)
			Chrysene	218-01-9	0.059	(2)	8.2	(1)
			o-Cresol	95-48-7	0.11	(2)	5.6	(1)
			Cresol (m- and p-isomers).		0.77	(2)	3.2	(1)
			Cyclohexanone	108-94-1	0.36	(2)	NA	
			1,2-Dibromo-3-chloropropane.	96-12-8	0.11	(2)	15	(1)
			1,2-Dibromoethane (Ethylene dibromide).	106-93-4	0.028	(2)	15	(1)
			Dibromomethane	74-95-3	0.11	(2)	15	(1)
			2,4-Dichlorophenoxyacetic acid (2, 4-D).	94-75-7	0.72	(2)	10	(1)
			o,p'-DDD	53-19-0	0.023	(2)	0.087	(1)
			p,p'-DDD	72-54-8	0.023	(2)	0.087	(1)

TABLE E-5B

o,p'-DDE	3424-82-6	0.031	(²)	0.087	(¹)
p,p'-DDE	72-55-9	0.031	(²)	0.087	(¹)
o,p'-DDT	789-02-6	0.0039	(²)	0.087	(¹)
p,p'-DDT	50-29-3	0.0039	(²)	0.087	(¹)
Dibenz(a,h) anthracene	53-70-3	0.055	(²)	8.2	(¹)
Dibenzo(a,e) pyrene	192-65-4	0.061	(²)	NA	
m-Dichlorobenzene	541-73-1	0.036	(²)	6.2	(¹)
o-Dichlorobenzene	95-50-1	0.088	(²)	6.2	(¹)
p-Dichlorobenzene	106-46-7	0.090	(²)	6.2	(¹)
Dichlorodifluoromethane.	75-71-8	0.23	(²)	7.2	(¹)
1,1-Dichloroethane	75-34-3	0.059	(²)	7.2	(¹)
1,2-Dichloroethane	107-06-2	0.21	(²)	7.2	(¹)
1,1-Dichloroethylene	75-35-4	0.025	(²)	33	(¹)
trans-1,2-Dichloroethylene.		0.054	(²)	33	(¹)
2,4-Dichlorophenol	120-83-2	0.044	(²)	14	(¹)
2,6-Dichlorophenol	87-65-0	0.044	(²)	14	(¹)
1,2-Dichloropropane	78-87-5	0.85	(²)	18	(¹)
cis-1,3-Dichloropropene.	10061-01-5	0.036	(²)	18	(¹)
trans-1,3-Dichloropropene.	10061-02-6	0.036	(²)	18	(¹)
Dieldrin	60-57-1	0.017	(²)	0.13	(¹)
Diethyl phthalate	84-66-2	0.20	(²)	28	(¹)
2,4-Dimethyl phenol	105-67-9	0.036	(²)	14	(¹)
Dimethyl phthalate	131-11-3	0.047	(²)	28	(¹)
Di-n-butyl phthalate	84-74-2	0.057	(²)	28	(¹)
1,4-Dinitrobenzene	100-25-4	0.32	(²)	2.3	(¹)
4,6-Dinitro-o-cresol	534-52-1	0.28	(²)	160	(¹)
2,4-Dinitrophenol	51-28-5	0.12	(²)	160	(¹)
2,4-Dinitrotoluene	121-14-2	0.32	(²)	140	(¹)
2,6-Dinitrotoluene	606-20-2	0.55	(²)	28	(¹)
Di-n-octyl phthalate	117-84-0	0.017	(²)	28	(¹)
Di-n-propylnitrosoamine	621-64-7	0.40	(²)	14	(¹)
Diphenylamine	122-39-4	0.52	(²)	NA	
1,2-Diphenyl hydrazine	122-66-7	0.087	(²)	NA	
Diphenyl nitrosamine	621-64-7	0.40	(²)	NA	
1, 4-Dioxane	123-91-1	0.12	(²)	170	(¹)
Disulfoton	298-04-4	0.017	(²)	6.2	(¹)
Endosulfan I	939-98-8	0.023	(²)	0.066	(¹)
Endosulfan II	33213-6-5	0.029	(²)	0.13	(¹)
Endosulfan sulfate	1031-07-8	0.029	(²)	0.13	(¹)
Endrin	72-20-8	0.0028	(²)	0.13	(¹)
Endrin aldehyde	7421-93-4	0.025	(²)	0.13	(¹)
Ethyl acetate	141-78-6	0.34	(²)	33	(¹)
Ethyl cyanide	107-12-0	0.24	(²)	360	(¹)
Ethyl benzene	100-41-4	0.057	(²)	6.0	(¹)
Ethyl ether	60-29-7	0.12	(²)	160	(¹)

TABLE E-5B (continued)

268.43 TABLE CCW.—CONSTITUENT CONCENTRATIONS IN WASTES—Continued

Waste code	Commercial chemical name	See also	Regulated hazardous constituent	CAS number for regulated hazardous constituent	Wastewaters		Nonwastewaters	
					Concentration (mg/l)	Notes	Concentration (mg/kg)	Notes
			bis(2-Ethylhexyl) phthalate.	117-81-7	0.28	(2)	28	(1)
			Ethyl methacrylate	97-63-2	0.14	(2)	160	(1)
			Ethylene oxide	75-21-8	0.12	(2)	NA	
			Famphur	52-85-7	0.017	(2)	15	(1)
			Fluoranthene	206-44-0	0.068	(2)	8.2	(1)
			Fluorene	86-73-7	0.059	(2)	4.0	(1)
			Fluorotrichloromethane	75-69-4	0.020	(2)	33	(1)
			Heptachlor	76-44-8	0.0012	(2)	0.066	(1)
			Heptachlor epoxide	1024-57-3	0.016	(2)	0.066	(1)
			Hexachlorobenzene	118-74-1	0.055	(2)	37	(1)
			Hexachlorobutadiene	87-68-3	0.055	(2)	28	(1)
			Hexachlorocyclopentadiene.	77-47-4	0.057	(2)	3.6	(1)
			Hexachlorodibenzofurans.		0.000063	(2)	0.001	(1)
			Hexachlorodibenzo-p-dioxins.		0.000063	(2)	0.001	(1)
			Hexachloroethane	67-72-1	0.055	(2)	28	(1)
			Hexachloropropene	1888-71-7	0.035	(2)	28	(1)
			Indeno(1,2,3-c,d)pyrene.	193-39-5	0.0055	(2)	8.2	(1)
			Iodomethane	74-88-4	0.19	(2)	65	(1)
			Isobutanol	78-83-1	5.6	(2)	170	(1)
			Isodrin	465-73-6	0.021	(2)	0.066	(1)
			Isosafrole	120-58-1	0.081	(2)	2.6	(1)
			Kepone	143-50-0	0.0011	(2)	0.13	(1)
			Methacrylonitrile	126-98-7	0.24	(2)	84	(1)
			Methanol	67-56-1	5.6	(2)	NA	
			Methapyrilene	91-80-5	0.081	(2)	1.5	(1)
			Methoxychlor	72-43-5	0.25	(2)	0.18	(1)
			3-Methylcholanthrene	56-49-5	0.0055	(2)	15	(1)
			4,4-Methylene-bis-(2-chloroaniline).	101-14-4	0.50	(2)	35	(1)
			Methylene chloride	75-09-2	0.089	(2)	33	(1)
			Methyl ethyl ketone	78-93-3	0.28	(2)	36	(1)
			Methyl isobutyl ketone	108-10-1	0.14	(2)	33	(1)
			Methyl methacrylate	80-62-6	0.14	(2)	160	(1)
			Methyl methansulfonate.	66-27-3	0.018	(2)	NA	
			Methyl parathion	298-00-0	0.014	(2)	4.6	(1)
			Naphthalene	91-20-3	0.059	(2)	3.1	(1)

TABLE E-5B (continued)

2-Naphthylamine	91-59-8	0.52	(2)	NA	
p-Nitroaniline	100-01-6	0.028	(2)	28	(1)
Nitrobenzene	98-95-3	0.068	(2)	14	(1)
5-Nitro-o-toluidine	99-55-8	0.32	(2)	28	(1)
4-Nitrophenol	100-02-7	0.12	(2)	29	(1)
N-Nitrosodiethylamine	55-18-5	0.40	(2)	28	(1)
N-Nitrosodimethylamine.	62-75-9	0.40	(2)	NA	
N-Nitroso-di-n-butylamine.	924-16-3	0.40	(2)	17	(1)
N-Nitrosomethylethylamine.	10595-95-6	0.40	(2)	2.3	(1)
N-Nitrosomorpholine	59-89-2	0.40	(2)	2.3	(1)
N-Nitrosopiperidine	100-75-4	0.013	(2)	35	(1)
N-Nitrosopyrrolidine	930-55-2	0.013	(2)	35	(1)
Parathion	56-38-2	0.014	(2)	4.6	(1)
Pentachlorobenzene	608-93-5	0.055	(2)	37	(1)
Pentachlorodibenzofurans.		0.000063	(2)	0.001	(1)
Pentachlorodibenzo-p-dioxins.		0.000063	(2)	0.001	(1)
Pentachloronitrobenzene.	82-68-8	0.055	(2)	4.8	(1)
Pentachlorophenol	87-86-5	0.089	(2)	7.4	(1)
Phenacetin	62-44-2	0.081	(2)	16	(1)
Phenanthrene	85-01-8	0.059	(2)	3.1	(1)
Phenol	108-95-2	0.039	(2)	6.2	(1)
Phorate	298-02-2	0.021	(2)	4.6	(1)
Phthalic anhydride	85-44-9	0.069	(2)	NA	
Pronamide	23950-58-5	0.093	(2)	1.5	(1)
Pyrene	129-00-0	0.067	(2)	8.2	(1)
Pyridine	110-86-1	0.014	(2)	16	(1)
Safrole	94-59-7	0.081	(2)	22	(1)
Silvex (2,4,5-TP)	93-72-1	0.72	(2)	7.9	(1)
2,4,5-T	93-76-5	0.72	(2)	7.9	(1)
1,2,4,5,-Tetrachlorobenzene.	95-94-3	0.055	(2)	19	(1)
Tetrachlorodibenzofurans.		0.000063	(2)	0.001	(1)
Tetrachlorodibenzo-p-dioxins.		0.000063	(2)	0.001	(1)
1,1,1,2-Tetrachloroethane.	630-20-6	0.057	(2)	42	(1)
1,1,2,2-Tetrachloroethane.	79-34-5	0.057	(2)	42	(1)
Tetrachloroethylene	127-18-4	0.056	(2)	5.6	(1)
2,3,4,6-Tetrachlorophenol.	58-90-2	0.030	(2)	37	(1)
Toluene	108-88-3	0.080	(2)	28	(1)

TABLE E-5B (continued)

268.43 TABLE CCW.—CONSTITUENT CONCENTRATIONS IN WASTES—Continued

Waste code	Commercial chemical name	See also	Regulated hazardous constituent	CAS number for regulated hazardous constituent	Wastewaters		Nonwastewaters	
					Concentration (mg/l)	Notes	Concentration (mg/kg)	Notes
			Toxaphene	8001-35-1	0.0095	(2)	1.3	(1)
			1,2,4-Trichlorobenzene	120-82-1	0.055	(2)	19	(1)
			1,1,1-Trichloroethane	71-55-6	0.054	(2)	5.6	(1)
			1,1,2-Trichloroethane	79-00-5	0.054	(2)	5.6	(1)
			Trichloroethylene	79-01-6	0.054	(2)	5.6	(1)
			2,4,5-Trichlorophenol	95-95-4	0.18	(2)	37	(1)
			2,4,6-Trichlorophenol	88-06-2	0.035	(2)	37	(1)
			1,2,3-Trichloropropane	96-18-4	0.85	(2)	28	(1)
			1,1,2-Trichloro-1,2,2-trifluoro ethane	76-13-1	0.057	(2)	28	(1)
			Tris(2,3-dibromopropyl) phosphate.	126-72-7	0.11	(2)	NA	
			Vinyl chloride	75-01-4	0.27	(2)	33	(1)
			Xylene(s)		0.32	(2)	28	(1)
			Cyanides (Total)	57-12-5	1.2	(2)	1.8	(1)
			Fluoride	16984-48-8	35	(2)	NA	
			Sulfide	8496-25-8	14	(2)	NA	
			Antimony	7440-36-0	1.9	(2)	NA	
			Arsenic	7440-38-2	1.4	(2)	NA	
			Barium	7440-39-3	1.2	(2)	NA	
			Beryllium	7440-41-7	0.82	(2)	NA	
			Cadmium	7440-43-9	0.20	(2)	NA	
			Chromium (Total)	7440-47-32	0.37	(2)	NA	
			Copper	7440-50-8	1.3	(2)	NA	
			Lead	7439-92-1	0.28	(2)	NA	
			Mercury	7439-97-6	0.15	(2)	NA	
			Nickel	7440-02-0	0.55	(2)	NA	
			Selenium	7782-49-2	0.82	(2)	NA	
			Silver	7440-22-4	0.29	(2)	NA	
			Thallium	7440-28-0	1.4	(2)	NA	
			Vanadium	7440-62-2	0.042	(2)	NA	
			Zinc	7440-66-6	1.0	(2)	NA	
K001	NA	Table CCWE in 268.41	Naphthalene	91-20-3	0.031	(1)	1.5	(1)
			Pentachlorophenol	87-86-5	0.18	(1)	7.4	(1)
			Phenanthrene					
			Pyrene	85-01-8	0.031	(1)	1.5	(1)
			Toluene	129-00-0	0.028	(1)	1.5	(1)
			Xylenes (Total)	108-88-3	0.028	(1)	28	(1)
			Lead		0.032	(1)	33	(1)
				7439-92-1	0.037		NA	
K002	NA	Table CCWE in 268.41	Chromium (Total)	7440-47-32	0.9	(2)	NA	
			Lead	7439-92-1	3.4	(2)	NA	

TABLE E-5B (continued)

APPENDIX F
DESCRIPTION OF RETAINED OPTIONS

APPENDIX F

TABLE OF CONTENTS

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS

Spill Control Options

Option 4.4.3 Construct Centralized Tank Farm for Spill Control/Capture

A. Option Components and Basis of Conceptual Design

Storage - The volume of tankage required for this option could vary between wide limits. For instance, to provide the existing "live" capacity in the spill control ponds (A-1, A-2, B-1, B-2 and C-2) would require 69.5 acre-feet of storage.

For the A- and B-series ponds, 20.5 acre-feet is required. This volume is equivalent to the basin runoff generated by a 1- to 2-year storm which would require 6.7 million gallons of tankage and a major construction effort. The peak runoff rate associated with a 1- to 2-year, 6-hour storm is approximately 80 cfs in each drainage, but, it is not practical to pump at 80 cfs because of the size of pump required. Since this pumping rate cannot practically be achieved, runoff contaminated by spills will still need to be diverted to the existing spill ponds for temporary storage.

The C-2 pond accepts both spills and normal stormwater runoff. To equal its live capacity of 49 acre-feet in tanks would be impractical. The peak runoff rate to C-2 is also beyond the practical scope for diverting stormwater (i.e., 40 cfs for a 5-year event).

This option could be altered enough to be beneficial and feasible by using a lower pumping rate and smaller storage tanks (250,000 gallons). The dimensions of a 250,000-gallon tank are 42 feet in diameter and 24 feet high. A single tank would serve each of the A-, B- and C-series drainages as a primary response measure. The existing spill control ponds would be maintained for initial capture and reserve capacity. Water in the tanks would be sampled, treated if necessary and then either discharged or disposed.

Piping - Approximately 4500 feet of 8-inch diameter PVC pipe would be required to carry flows from Ponds A-1, B-1 and C-2 to the centralized tanks.

Pumps - Three pump stations rated at 1600 gallons per minute (gpm) each would be utilized to pump water from A-1, B-1 and C-2 to the centralized tanks. These high-volume pumps would be effective in isolating a nominal amount of contaminated runoff.

B. Conceptual Cost Estimate

Tankage @ $1/gallon	$750,000
Piping @ $30/foot	135,000
Pumps @ $70,000/cfs or $250,000/pump station	750,000
	$1,635,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C. Comparative Analysis Criteria

C.1 Risk Reduction

This option would provide additional spill control/capture facilities since the existing spill containment pond network would need to remain in place as a back-up system. The use of tanks would allow a spill to be isolated from the environment to a greater extent than is possible with the ponds.

C.2 Funding and Schedule Constraints

A centralized tank can be implemented over a period of time since the existing spill control ponds will remain as a back-up system. Additional tanks could be added later. Earthwork will be required to prepare a site for the tanks.

C.3 Cost-effectiveness

A centralized tank farm would require more piping than the placement of separate tanks on each drainage, but less site preparation for tank construction.

C.4 Versatility

This option would add versatility to Rocky Flats Plant's (RFP's) pond management system since it would allow a spill to be contained and isolated while allowing the existing ponds to be available to capture a second spill or contaminated storm runoff event.

C.5 Operable Unit (OU) Interactions

This option would be independent of all known OU actions.

C.6 Waste Generation

Sediments would be deposited in the existing ponds and would require maintenance over time. Significant sediment accumulations would not be expected in the tanks.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4.4.4 Construct Tanks for Spill Control/Capture on Each Drainage

A. Option Components and Basis of Conceptual Design

Storage - The volume of tankage required for this option could vary. To equal the existing "live" capacity in the basin spill ponds (A-1, A-2, B-1, B-2 and C-2) would require 69.5 acre-feet of storage. For the A- and B-series ponds, this volume is equivalent to the runoff generated by a 1- to 2-year storm and would require 6.7 million gallons of tankage and a major construction effort. The peak runoff rate associated with a 1- to 2-year, 6-hour storm is approximately 80 cfs in each drainage, but, it is not practical to pump 80 cfs because of the size of pumps required. Since this pumping rate cannot practically be achieved, runoff contaminated by spills would still need to be diverted to the existing spill ponds for temporary storage.

Similar conditions exist on the C drainage where 49 acre-feet of the live storage is currently available. The peak inflow rate for a 5-year storm is 40 cfs. Pumping at the peak flow rate and providing equivalent storage would not be practically feasible.

This option could be altered enough to be beneficial and feasible by using a lesser pumping rate and smaller storage tank capacity in each of the basins (250,000 gallons). The dimensions of each tank in each of the three drainage basins would be 42 feet in diameter and 24 feet high.

Piping - Approximately 500 feet of 8-inch diameter PVC pipe will be required to carry flows from a pump station just upstream of each of the ponds (A-1, B-1 and C-2) to the tanks.

Pumps - Three pumps, one for each tank, would be required. These pumps would be rated at 1600 gpm so that they could be able to isolate a nominal amount of contaminated runoff.

B. Conceptual Cost Estimate

Tankage @ $1/gallon	$ 750,000
500 feet Piping @ $30/foot	15,000
Pumps @ $70,000/cfs or $250,000/pump station	750,000
	$1,515,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C. Comparative Analysis Criteria

C.1 Risk Reduction

This option would provide additional spill control/capture facilities since the existing spill containment pond network will need to remain in place as a back-up system. The use of a tank allows a spill to be isolated from the environment to a greater extent than is possible with the ponds. This option provides larger storage capacity compared to Option 4.4.3.

C.2 Funding and Schedule Constraints

Tanks could be installed over a period of time, since the existing spill containment ponds would remain as a back-up system. Additional tanks could be added later. A considerable amount of earthwork would be required to prepare a site for tanks of this size.

C.3 Cost-effectiveness

Tanks placed in each basin would require less piping than a centralized tank farm, but a centralized tank location would require less site preparation for construction. This option can be compared directly to Option 4.4.3 (construct centralized tank farm for spill control/capture) for cost-effectiveness. This option results in a greater expense since a higher percentage of cost would be devoted to tanks rather than pumps and piping.

C.4 Versatility

This option is versatile since it would allow a spill to be contained and isolated and keep the existing ponds available to capture a second spill or contaminated storm runoff event. This option provides more versatility than a centralized tank farm because it places a separate spill containment tank in each basin and provides a greater total volume of tanks.

C.5 OU Interactions

This option would be independent of all known OU actions.

C.6 Waste Generation

Sediments would tend to accumulate in the existing ponds and would require maintenance over time. Significant sediment accumulations would not be expected in the tanks.

Option 4.4.8 Utilize Existing Ponds A-1, A-2, B-1 and B-2 for Spill Control/Capture

A. Option Components and Basis of Conceptual Design

Storage - Utilize existing ponds for storage and maximize "live" storage to the extent possible. The current maximum drawdown is to the 30 percent capacity level for all spill containment ponds. An analysis should be conducted to determine if this maximum drawdown can be increased for any or all of the spill containment ponds in order to provide more "live" storage.

B. Conceptual Cost Estimate

Negligible costs would be required to implement this option.

C. Comparative Analysis Criteria

C.1 Risk Reduction

This option would provide two storage facilities in series on each of the A and B drainages. The C drainage would have a single storage pond. This would allow for system redundancy which increases the opportunity for isolation of a spill. This option could provide additional spill control/capture volume by utilizing more "live" storage than currently exists and would not depend on pumps or pipes to capture contaminated runoff.

C.2 Funding and Schedule Constraints

This option requires minimal expenditure and could be implemented immediately. Funding should be provided to address dam maintenance and dam safety concerns which were raised in the Army Corps of Engineers (COE) report released in 1993 (COE, 1993).

C.3 Cost-effectiveness

This option could be implemented for minimal cost and would provide effective spill control storage. Providing storage in ponds is more economical than storage in tanks.

C.4 Versatility

The use of four spill control/capture ponds is a versatile option because it allows for runoff contaminated by spills to be isolated from the remainder of the pond system.

C.5 OU Interactions

This option would be independent of all known OU actions.

C.6 Waste Generation

Sediments would accumulate in the ponds and would require maintenance over time.

Option 4.4.9 Consolidate Existing Spill Control Ponds to One Per Drainage

A. Option Components and Basis of Conceptual Design

Storage - Consolidation of ponds would most likely involve enlargement of the largest spill pond on each drainage, namely Ponds A-2 and B-2. Providing a comparable storage volume to that provided by the existing ponds would require an increase in Pond A-2's volume by 3 acre-feet (a 20 percent enlargement), resulting in a depth increase of 1 foot, and an increase to Pond B-2's volume by 1.1 acre-feet (a 20 percent enlargement), resulting in a 1-foot increase in depth.

B. Conceptual Cost Estimate

A-2 enlargement @ $50,000/acre-foot	$150,000
B-2 enlargement @ $50,000/acre-foot	60,000
	$210,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C. Comparative Analysis Criteria

C.1 Risk Reduction

This option could provide a simplified operating procedure for spill control/capture and would reduce the number of sampling locations. However, this option would limit system redundancy by leaving no volume in reserve for spills and less ability to isolate spills as compared to two ponds per drainage.

C.2 Funding and Schedule Constraints

Should modification of the dams be required for safety, these activities could disturb or cover existing sediment which may be contaminated (COE 1993). The dam might have to be bypassed during construction.

C.3 Cost-effectiveness

The cost of consolidating storage facilities would not be offset by any increase in spill volume.

C.4 Versatility

This option would be less versatile operationally for isolating spilled material than Option 4.4.8 (Utilize Existing Ponds A-1, A-2, B-1, B-2 and C-2 for Spill Control/Capture). It would also be less versatile for longer-term clean-up operations which may require the use of one pond for spill control while the other is remediated.

C.5 OU Interactions

This option would be independent of all known OU actions.

C.6 Waste Generation

Future sediment deposition would go to only one spill containment pond location per basin rather than two per basin. The amount of sediment deposited would not increase or decrease from existing conditions.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Stormwater Collection and Storage Options

Option 4.5.1 Maintain and Continue Using Existing On-line Stormwater Ponds

A. Option Components and Basis of Conceptual Design

Monitoring - This option would implement recommendations from the Corps of Engineers report (COE 1993) concerning increased monitoring of the phreatic water surface in the terminal ponds dam embankments through the installation of piezometers and continued analysis of structural integrity to assure dam safety.

Surface Water System Improvements - This option would provide modifications to the following bypass pipes or channels as follows:

- A-series Ponds - Increase the capacity of the A-series bypass pipe which normally carries flow past the spill containment ponds (A-1 and A-2) to Pond A-3. This is a 42-inch corrugated metal pipe (CMP) with a capacity of 90 cfs. When the capacity is exceeded, which begins to occur during a six-hour storm event with a return period of two years, excess flows begin to fill A-1 and sometimes A-2. This can reduce or eliminate the available live volume for spill control/capture and may increase the volume of water requiring treatment.

  Improvements would include modifications to the existing gate structure and a concrete-lined channel. Details of this option are contained in the Drainage and Flood Control Master Plan (EG&G, 1992).

- B-series Ponds - Increase the capacity of the B-series bypass pipe which normally carries flow around Ponds B-1, B-2 and B-3 to B-4 and B-5. This bypass pipe is a 48-inch CMP with a capacity of 160 cfs. When the capacity is exceeded, which begins to occur for a six-hour storm event with a return period of five to ten years, excess flows will enter B-1, B-2 and B-3. This can reduce or eliminate available live volume for spill control/capture and for isolation of STP effluent storage.

  These improvements would include a new concrete-lined channel as detailed in the Drainage and Flood Control Master Plan (EG&G, 1992).

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

- C-series Ponds - The Woman Creek Bypass Canal (WCBC) is designed to carry flow from Woman Creek around Pond C-2. Pond C-2 captures flow from the south side of the plant site via the South Interceptor ditch. WCBC features a concrete stream diversion structure immediately upstream of Pond C-2 which diverts Woman Creek flows through seven 60-inch culverts to the bypass canal. As originally constructed, the capacity of the WCBC was in excess of the 100-year, 6-hour peak flow of 730 cfs. A recent EG&G report, "Woman Creek Bypass Canal Report 1991" (SWD-008-92), dated June 18, 1992 by Doug Murray (EG&G), describes large reductions in the flow capacity due to vegetation growth and related vegetative debris. The report also states that current flow capacity is estimated at 260 cfs, or slightly less than the 25-year return period flow. When this capacity is exceeded, flows begin to enter C-2, potentially reducing the ability of C-2 to contain stormwater runoff of spills from the south side of the plant site and mixing stormwater with potentially contaminated water requiring testing and possibly treatment.

  A component of this option would be to take immediate measures to restore the capacity of the WCBC. There are also deficiencies due to vegetative growth in the West Interceptor Canal and the West Walnut Creek Bypass Canal (both are west of the plant site) and the South Interceptor Ditch leading to Pond C-2. These problems should also be remedied as part of this option. The components of this improvement are detailed in the Drainage and Flood Control Master Plan (EG&G, 1992).

B. Conceptual Cost Estimate

Dam Safety Monitoring	$ 100,000
Surface Water System Improvements	
A-series ponds	1,000,000
B-series ponds	900,000
C-series ponds (restore capacity of South Interceptor Ditch and Woman Creek Bypass Channel)	500,000
Clean out 2 channels west of plant site	500,000
	$3,000,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C. Comparative Analysis Criteria

C.1 Risk Reduction

The measures included in this option would increase the ability of the stormwater ponds to receive the stormwater, thereby allowing the spill ponds to be available for their intended purpose. The improved bypass capacity would reduce the potential for stormwater flows to overwhelm the spill control ponds and carry contaminants downstream.

C.2 Funding and Schedule Constraints

Existing systems could remain operational during the construction phase and would not impede current pond management. Projects could be implemented in phases.

C.3 Cost-effectiveness

This option would provide immediate, recognizable benefits for a relatively low cost.

C.4 Versatility

This option would provide versatility by addressing problems associated with stormwater management, as well as spill control/capture. This option would increase the ability to isolate and monitor STP effluent as needed.

C.5 OU Interactions

This option would be independent of all known OU actions.

C.6 Waste Generation

Sediments would accumulate in the ponds and bypass canals and would require periodic maintenance. Erosion would be controlled during construction activities.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4.5.4 Consolidate Existing Stormwater Ponds to One Per Drainage

A. Option Components and Basis of Conceptual Design

Storage - Consolidation of ponds would most likely involve enlargement of the largest of the existing ponds, namely A-4 and B-5. Pond C-2 would not be modified since it is currently the only stormwater pond on the C drainage receiving core area runoff. To provide a comparable volume of storage provided by the existing ponds would require an increase in Pond A-4's volume by 35 acre-feet (a 35 percent enlargement), resulting in a depth increase of 7.5 feet, and an increase of 1 acre-foot to Pond B-5's volume (a 2 percent enlargement), resulting in a 0.2-foot increase in depth.

B. Conceptual Cost Estimate

A-4 enlargement @ $50,000/acre-foot	$1,750,000
B-5 enlargement @ $50,000/acre-foot	50,000
	$1,800,000

C. Comparative Analysis Criteria

C.1 Risk Reduction

Consolidating stormwater ponds can provide a simplified operating procedure. The safety of the existing stormwater dam can also be addressed by this option. However, hazards associated with a dam failure would be increased since all basin storage would be located in one pond. This option would reduce the number of sampling points.

Consolidating the ponds could result in contamination to larger volumes of water, possibly resulting in increased treatment requirements. This option would reduce system redundancy and lessen reserve storage potential in the event of contamination.

For this option, future sediment deposition would accumulate in only one stormwater location per basin. This option would mean the loss of the capability to isolate STP effluent in Pond B-3.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C.2 Funding and Schedule Constraints

The proposed modification of the terminal dam could disturb existing sediment which may be contaminated. Flows would have to bypass the terminal pond during construction.

C.3 Cost-effectiveness

The costs would not be offset by any increase in storage volume.

C.4 Versatility

This option would be less versatile for isolating incoming flows for monitoring and/or treatment than Option 4.5.1 (maintain and continue using existing on-line stormwater ponds).

C.5 OU Interactions

This option would be independent of all known OU actions.

C.6 Waste Generation

Future sediment deposition would accumulate in only one pond location per basin. This project would require moving large quantities of earth, and may create waste which may not be disposed on-site.

Option 4.5.12 Construct Storage Tanks for STP Effluent Only

A. Option Components and Basis of Conceptual Design

Storage - The volume of storage required for this option is a function of the incoming effluent flow rate and the required holding time. Assuming these tanks would be used on a routine basis (rather than for "upsets" or spill collection) and that any tank must be batch-sampled rather than continuously-sampled, the tanks would be sized by computing the product of inflow and holding time. A reasonable turnaround time for Segment 5 analytes which include organics, metals and radionuclides is 21 days. Using a design flow of 0.15 million gallons per day (MGD) and a contingency factor of 25 percent, a storage volume of 4 million gallons would be required. Four one-million-gallon tanks (each sized at 80 feet diameter and 28 feet tall) would occupy at least 1 acre of land.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Pumps - A pump station rated at 250 gpm would be required to keep pace with the rate of STP effluent discharge and to deliver the discharge to the tanks.

B. Conceptual Cost Estimate

Tanks @ $1/gallon	$4,000,000
Pump station @ $50,000 each	50,000
	$4,050,000

C. Comparative Analysis Criteria

C.1 Risk Reduction

Reducing or eliminating STP effluent discharges from the B-series pond system would reduce nutrient loadings which routinely cause algae blooms in the ponds. Discharges from the tanks could be sent directly to Segment 4 following sampling.

Potential STP effluent upsets would be independently contained and would not impact routine stormwater management operations.

C.2 Funding and Schedule Constraints

This option's use of four tanks would allow it to be implemented over a period of time. Each tank could come on-line at different times.

C.3 Cost-effectiveness

There would be a high cost to this option without substantial justification. High operations and maintenance costs would be incurred for repairing, cleaning, disinfecting, inspecting and operating these tanks.

C.4 Versatility

These tanks would need to be dedicated to STP effluent and would not be available for stormwater-related spill control (in order to avoid commingling of clean effluents with contaminated stormwater) and thus the option would have limited versatility.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C.5 OU Interactions

This option would be independent of all known OU actions.

C.6 Waste Generation

Soil disturbance would occur during site preparation for tank construction. Maintenance activities would include periodic disposal of accumulated sediment in the tanks.

Treatment Options

Option 4.6.1 Construct Mobile Treatment Units for Multi-pond Use

A. Option Components and Basis of Conceptual Design

Mobile treatment units would be utilized as needed to address stormwater (or spills in spill containment ponds) which does not meet water quality standards for discharge or transfer.

Pumps - Two to three portable/submersible pumps of varying sizes (15/50/100 gpm) would be required for pond pumping.

Piping - Approximately 200 to 300 feet of flexible piping would be needed to transfer water to mobile unit from the pond(s) and to the discharge point from the mobile unit.

Treatment Units - Single or multiple mobile units would be necessary for processes including pretreatment and multi-stage treatment depending on constituents and volumes to be treated. A rented mobile treatment unit used at RFP may not be able to be cost-effectively decontaminated and used elsewhere. The purchase cost is therefore a consideration of this option.

Power Source - 220 volt wiring or a generator would be required.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

B. Conceptual Cost Estimate

Rental of a 15-gpm multi-stage (e.g., ion exchange/GAC/precipitation) system with operator	$750 to 1000/day
Purchase of a mobile 15-gpm multi-stage exchange/GAC/precipitation) system with operator	150,000
Pumps and piping	20,000
	Total Costs are dependent on the duration of treatment operations.

C. Comparative Analysis Criteria

C.1 Risk Reduction

Minor risk reduction is expected from this option because it is unlikely that treatment could reduce contaminants of concern (COCs) to significantly lower levels than the capabilities of the current technology and facilities. However, mobile treatment unit(s) offer the most strategic method for addressing COCs at problem areas when detected. This option may also reduce risk associated with slug discharges resulting from spills.

C.2 Funding and Schedule Constraints

Renting a few portable treatment systems would minimize capital construction costs. Construction/Assembly of the system could involve a long lead time because of the uniqueness of the system and the small number of contractors with this type of design/construction expertise.

C.3 Cost-effectiveness

Mobile treatment units could allow treatment of multiple sources with one unit, thereby resulting in higher cost effectiveness over using individual systems for each source. Mobile treatment systems could also contracted from suppliers of such services which would be economical. Cost-effectiveness would nonetheless be low, however, due to the low COC levels. Cost-effectiveness would be further reduced if a variety of portable systems are required to ensure treatment for an acceptable range of COCs. Another reduction in cost-effectiveness would occur if numerous systems are required to treat a single source if portable systems are purchased for stand-by use, or if extensive influent storage is required.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

It is possible that if a mobile treatment unit is used to treat a highly-contaminated volume of water, the unit could not be decontaminated to an acceptable level for use by the contractor elsewhere and would need to be purchased.

C.4 Versatility

This option would be extremely versatile because multiple sources could be addressed with a single system. Multiple stage systems would be most versatile because they would be applicable to a wide range of COCs. Treatment could also be contracted on an as-needed basis.

C.5 OU Interactions

This option is independent of all known OU actions.

C.6 Waste Generation

Depending on the treatment type implemented, filter cake or spent medias may be classified as low-level wastes. Waste volumes would be minor because of low constituent levels.

Option 4.6.2 Construct Individual Treatment Facilities at Each Pond

A. Option Components and Basis of Conceptual Design

Storage - 1000 to 2000 gallons of influent storage (equalization) would be required at each treatment facility.

Piping - To transfer water to the treatment system from influent storage and to the discharge point from treatment system, approximately 1000 total feet of piping would be required.

Pump Stations - Pumps and controls would be required at each pond with approximately 100 gpm capacity each. A 100-gpm pumping rate would be consistent with the expected treatment rate.

Treatment Systems - Multi-stage treatment facilities would be housed in a completely enclosed structure. Facilities could be shared by 2 to 3 ponds, depending on locations, to reduce costs.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Power Source - 220-volt wiring or a generator would be required.

B. Conceptual Cost Estimate

4-5 Storage facilities @ $20,000 each	$100,000
Piping @ $30/foot	30,000
Pumps @ $70,000/cfs or $20,000 each	100,000
4-5 Treatment facilities @ $5M-$10M each	35,000,000
	$35,230,000
Annual operation and maintenance costs	$250,000

C. Comparative Analysis Criteria

C.1 Risk Reduction

Only minor risk reduction is expected because it is unlikely that treatment could reduce COCs to significantly lower levels than the capabilities of the current technology and facilities. This option may reduce risk associated with slug discharges resulting from spills. Individual treatment systems will allow for optimum design capacity and technology.

C.2 Funding and Schedule Constraints

Individual treatment systems would be relatively expensive with total costs for all required facilities ranging from $5-50 million and would stretch the 5-year time frame due to construction requirements.

C.3 Cost-effectiveness

Placement of individual systems near sources would be cost-effective with respect to piping and pumping costs. Cost-effectiveness would be low, however, because the already low COC levels are not likely to be greatly reduced. Cost-effectiveness would be further reduced if extensive influent storage is required. Individual permanent systems would also be relatively expensive when compared to a mobile treatment unit.

C.4 Versatility

Versatility would be less than for mobile rented (or purchased) treatment units because those units could be requested for a specific treatment need following sampling.

C.5 OU Interactions

This option is independent of all known OU actions.

C.6 Waste Generation

Depending on the treatment type implemented, filter cake or spent medias could be classified as low-level wastes. Waste volumes would be relatively minor because of low constituent levels.

Option 4.6.7 Use Existing OU Treatment Facilities

A. Option Components and Basis of Conceptual Design

Treatment Systems - This option would utilize treatment systems currently available at the RFP including: OU 1, OU 2 and OU 4 treatment facilities.

In addition to OU treatment facilities, the 374 Evaporator was also evaluated for available capacity and potential use. The following table shows the characteristics of the existing OU treatment facilities and the 374 Evaporator:

Facility	Available Capacity	Technology	Influent Storage
OU 1 Treatment Facility	30 gpm, 16 hrs./day	ion exchange, UV oxidation	15,000 gal.
OU 2 Treatment Facility	45 gpm, 24 hrs./day, 330 days/yr.	neutralization, precip./co-precip., sedimentation, microfiltration, GAC	10,000 gal.
OU 4 Treatment Facility	51,000 gal/day, 150 - 365 days/yr.	straining, evaporation (VC and flash evap.)	1,380,000 gal.
374 Evaporator	None	decontamination, evaporation	850,000 gal.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Piping - 20,000 feet of piping would be required to transfer pond water to treatment systems for maximum versatility.

Pump Stations - Pumps and controls are required at each pond with approximately 100-gpm capacity each.

Tank Trucks - Tanker truck(s) to haul source water to treatment systems could be a viable alternative to pipe systems.

B. Conceptual Cost Estimate

Piping @ $30/foot	$300,000
Pump stations @ $70,000/cfs	160,000
Treatment systems	0
Tank trucks @ $100,000/truck	200,000
	$360,000-460,000

C. Comparative Analysis Criteria

C.1 Risk Reduction

This option would likely result in minor risk reduction because it is unlikely that treatment could reduce COCs to significantly lower levels. This option could reduce risk of slug discharges resulting from spills. Existing treatment facilities would reduce risks associated with COCs for which there is on-site treatment technology with available capacity.

Coordination of treatment of new influent sources with the influent source that existing facilities were originally designed to treat would not necessarily reduce overall site risks.

C.2 Funding and Schedule Constraints

Funding would not be a major issue for this option because only operational and maintenance (O&M) costs would increase. O&M cost data for existing facilities is not available for evaluation, but it is likely that incremental O&M costs would be minimal.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C.3 Cost-effectiveness

Use of existing systems makes the treatment component of this option cost-effective. The piping needed to convey water from the ponds to the treatment facilities and additional influent storage are the most costly components of this option. Trucking water to be treated could be a more cost-effective approach.

C.4 Versatility

This option is versatile because it expands capabilities of existing systems to include treatment of additional sources.

C.5 OU Interactions

This option may impact OU planning efforts by utilizing the remaining capacity at existing facilities. This option would require changes to the ROD.

C.6 Waste Generation

Waste volumes such as filter cakes and spent media would be increased with increased treatment rates. Wastes generated from new sources would be additive to current wastes and, therefore, classified similarly to low-level wastes.

Option 4.6.8 Expand Existing OU Treatment Facilities

A. Option Components and Basis of Conceptual Design

This option contains the same basic components which were required for Option 4.6.7, including expansion of existing treatment facilities.

Treatment Systems - OU facilities with potential for expansion include OU 1 (expand by 30 gpm), OU 2 (expand by 20 gpm) and OU 4. Additionally, the 374 Evaporator (expand by 10 to 15 gpm) which is located out of the OUs was evaluated for expansion.

B. Conceptual Cost Estimate

Discussions with RFP treatment personnel indicate that it would require significant capital costs to expand most existing treatment facilities. Costs to expand buildings housing treatment equipment may be particularly costly. Expansion costs are wide-ranging depending on technologies expanded or added to existing OUs. Such costs are estimated in the range of $100,000 to add additional ion exchange or GAC units to $20 million to add new technologies in expanded buildings.

Expansion of the 374 Evaporator facility from 32 gpm to 45 gpm would cost approximately $22 million.

All expansion costs would be additive to costs summarized in Option 4.6.7 which would be required to distribute pond water to existing OU treatment facilities.

C. Comparative Analysis Criteria

C.1 Risk Reduction

Minor risk reduction is expected because it is unlikely that treatment could reduce COCs to significantly lower levels. This option could reduce risk associated with slug discharges resulting from spills. Existing treatment facilities would reduce risks associated with COCs for which there is on-site treatment technology that could be expanded.

Coordination of treatment of new influent sources with the influent sources that existing facilities were originally designed to treat might not reduce overall site risks.

C.2 Funding and Schedule Constraints

Expansion of the A-4 tent facility to include new treatment technologies (i.e., radionuclide removal) would provide a versatile and strategically located facility.

C.3 Cost-effectiveness

Expansion of existing facilities, where possible, would be most cost-effective than constructing new facilities. Costs to transfer wastes to existing facilities would not be prohibitive.

C.4 Versatility

This option would be versatile because it expands capabilities of existing systems to include treatment of additional sources and allows centralized treatment for multiple source streams.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C.5 OU Interactions

This option would require changes to the ROD.

C.6 Waste Generation

Waste volumes such as filter cakes and spent media would be increased with increased treatment. Wastes generated from new sources would be additive to current wastes and, therefore, classified as low-level waste.

Option 4.6.9 Consolidate Treatment Facilities at Pond A-4 for Use by Entire Pond System

A. Option Components and Basis of Conceptual Design

Treatment Systems - This option would use the existing A-4 system including filter bags and GACs. The A-4 system currently contains a fully available capacity of approximately 1.7 MGD for organics treatment. This capacity could potentially be expanded.

At a minimum, radionuclides and metals treatment should be added to A-4's treatment capabilities.

Piping - Approximately 10,500 feet of piping would be required to collect pond water at Pond A-4 facilities.

Pump Stations - Pumps and controls at each pond with approximately 100 gpm capacity would be required.

Influent Storage - A relatively large influent storage tank with an approximate 1 MGD capacity would be necessary to fully utilize the A-4 treatment facility.

B. Conceptual Cost Estimate

Storage facility	$ 250,000
Piping @ $30/foot	315,000
Pump stations @ $70,000/cfs	160,000
Treatment facility expansion	2,000,000
	$2,725,000
Operation and maintenance costs	$ 250,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C. Comparative Analysis Criteria

C.1 Risk Reduction

Risks associated with slug discharges resulting from spills could be reduced. A comprehensive and strategically located treatment facility with expanded treatment capacity could provide effective risk reduction.

C.2 Funding and Scheduling Constraints

A single, large treatment system could be prohibitively expensive; however, because the existing A-4 organics treatment system could be expanded for multi-stage treatment it would reduce capital costs.

C.3 Cost-effectiveness

A single, large system at Pond A-4 would reduce piping and pumping costs. Use of A-4 facilities would offer a convenient, centrally located treatment system at which there would be no conflicting treatment objectives other than treating pond water. Also, there is significant capacity (1.7 MGD) currently available at A-4.

C.4 Versatility

A single system designed to treat multiple sources would be inherently versatile. Simultaneous treatment of multiple sources could be difficult.

C.5 OU Interactions

This option would be independent of all known OU actions.

C.6 Waste Generation

Wastes generated from new sources would be similar to wastes previously generated by the system. Upgrades to the existing system to expand treatment capabilities would generate different types of wastes (e.g., metals sludge, radionuclides, etc.).

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Alternative Water Transfer Options

Option 4.7.1.1 Recycle STP Effluent for On-site Industrial Use

A. Option Components and Basis of Conceptual Design

Pumping - Two pumping stations would be required for this option. One pumping station of approximately 200 gpm would be required to transfer STP effluent from surface storage to the recycle system surge tank. A second pump station of approximately 100 gpm would pump water out of the surge tank, through backflow preventers, and into the industrial water system against an existing head of approximately 50 feet.

Piping - Approximately 4000 feet of 8-inch diameter piping would be required to transfer water to the surge tank. This pipeline could be surface layed, or buried, depending on the design life of the system and type of pipe material selected.

Storage - Storage facilities would be required for this option for STP effluent prior to recycling efforts. Additional water storage required for this option would include a surge tank estimated at a 100,000-gallon capacity, located adjacent to and connected to the plant's industrial water supply header.

Treatment - STP effluent meeting Segment 5 criteria and other benchmarks identified in Table 3-1 would require no treatment other than suspended solids removal prior to its use as non-potable industrial water. This would be accomplished by a 4-stage, multi-media filter located just after the first pump station, and sized at 200 gpm.

Controls - Automatic/Manual controls would be required to prevent overfilling of the surge tank. Manual operation of the system would be required to protect pumping equipment and monitor effluent storage levels and filter performance.

B. Conceptual Cost Estimate

Construction	$1,500,000
Operations and maintenance/year	200,000
	$1,700,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C. Comparative Analysis Criteria

C.1 Risk Reduction

Health-based reductions in risk would be nominal. STP effluents under this option would already meet Segment 5 water quality criteria, and no additional treatment (other than sediment filtration) would be employed. Minor risk reduction would be possible through reduced downstream discharges. A minimal reduction could occur in pond storage levels, thereby reducing dam failure risks.

C.2 Funding and Schedule Constraints

This option would have minor cost and schedule constraints due to its relatively low cost, use of standard construction techniques and use of accepted technology.

C.3 Cost-effectiveness

This option would be a cost-effective approach to reducing downstream discharges and dam safety concerns and would also provide cost savings through decreased raw water purchases. However, the demand for recycled water for industrial use would likely decrease as industrial operations are phased out.

C.4 Versatility

Due to the availability of other recycle sources (from the 374 Evaporators) and the limited usage of raw water, this option cannot accomplish the total recycle of STP effluent. The maximum available raw water demand at RFP would be approximately 17 MG/yr, whereas the STP effluent volume would be approximately 55 MG/yr. STP effluent not being recycled would be discharged off-site according to current practices.

C.5 OU Interactions

This option would be independent of all known OU actions.

C.6 Waste Generation

This option would generate a small volume of waste in the form of used filter media and backflush waters from the multi-media filter. Estimated volumes would be approximately 5 cubic yards of low-hazard granular filter material (sand, grit, etc.) and 800-1000 gallons of non-toxic backwash water annually.

Option 4.7.1.2 Recycle Pond Water to RFP Industrial Water Supply

A. Option Components and Basis of Conceptual Design

The components and basis of design for this option are identical to those for recycling STP discharges (Option 4.7.1.1). Any surface water for which recycling is proposed, would require a pump station and filter at the water source location, piping, surge tank and controls.

B. Conceptual Cost Estimate

A-3, A-4 or B-5 recycling	
Recycling facilities	$2,800,000
Operations and maintenance	200,000
	$3,000,000
C-2 recycling	
Recycling facilities	$1,100,000
Operations and maintenance	200,000
	$1,300,000

C. Comparative Analysis Criteria

C.1 Risk Reduction

This option has the same risk reduction potential as Option 4.7.1.1, with the following addition:

Average annual stormwater runoff collected and discharged at RFP is approximately 120 million gallons (MG). Runoff is divided between drainages as follows: A-series - 55 MG, B-series - 45 MG, C-series - 20 MG. With an estimated industrial usage of 17 mg per year, no drainage could routinely achieve zero discharge, although during drier years, zero discharge of Pond C-2 would be achievable.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4.7.1.4 Directly Spray Evaporate Pond Water (Aerosol Spray Method) On-site

A. Option Components and Basis of Conceptual Design

Storage - This option assumes that storage facilities would be the existing surface water impoundments.

Piping - Piping to supply water to the spray heads would use 6-inch diameter aluminum or high-density polyethylene pipe. A 6-inch centrifugal pump would supply approximately 1200 linear feet of pipe with spray heads at 30- to 40-foot intervals.

Pumps - Either diesel-powered or electric-powered pumps capable of delivering 200-gpm flow rates and 30-35 psi pressure would be required for an aerosol spray system.

Spray Heads - Spray heads would be high-volume, riser-type atomizing spray, in order to maximize the volume of water evaporated.

System Layout - The system would spray water over the pond from which it came. Piping with spray heads could be located adjacent to the pond, or designed to float in the pond. Edge-located piping would be easier to install, maintain and operate.

Controls - Spray systems would be manually operated (start and stop) to ensure they are not operated in weather conditions which are not suitable for evaporation.

B. Conceptual Cost Estimate

Construction cost is estimated at $300,000 to $400,000 per pond. Utilizing 4 ponds will result in a total cost of $1,200,000 to $1,600,000.

O&M costs are estimated at $30,000 to $40,000 annually using plant site staff.

C. Comparative Analysis Criteria

C.1 Risk Reduction

Health-based reductions in risk would not be expected for water meeting Segment 5 standards. Spray evaporation operations would reduce or eliminate transfers between non-discharging ponds. Reduced pond storage levels would also improve dam safety.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C.2 Funding and Schedule Constraints

This option would have no cost or schedule constraints due to its low cost, low level of technology and ease of installation.

C.3 Cost-effectiveness

This option would not be a cost-effective method of reducing downstream discharges from stormwater ponds, and would only be cost-effective for small-volume ponds (i.e., spill control ponds) for which lowered pond levels may prevent the need to discharge or transfer from these ponds.

C.4 Versatility

Spray evaporation systems could be installed and operated at any pond meeting the required water quality criteria. Each spray head would be capable of evaporating 100 to 150 gallons per day (gpd) on an average basis. Limitations due to climatic conditions would result in seasonal operations (approximately April-October) and a need to store water prior to evaporation. A typical system comprising 40 heads and operated 180 days per year could evaporate approximately 900,000 gallons annually.

C.5 OU Interactions

This option interacts with planning and management aspects of OUs 5, 6 and 7, but does not preclude any actions to be taken during characterization or remediation of those OUs.

C.6 Waste Generation

No wastes would be generated by this option.

Option 4.7.1.5 Mechanically Evaporate Pond Water (Evaporative Coolers) On-site

A. Option Components and Basis of Conceptual Design

Pumping - Either diesel or electric-powered pumps would be required to pump water from storage to a new evaporator.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Evaporator Design - Mechanical evaporators would require heat inputs to promote evaporation. An evaporator capable of evaporating 10 MG/year (a typical size) would require a dependable source of energy in the form of waste heat, electrical energy, or other sources of power. System components would typically include pumping and feed controls, heat exchangers, heating elements, controls, recirculation piping, pre-filtration equipment and corrosion protection features.

B. Conceptual Cost Estimate

A 10 MG/year evaporator is conceptually estimated at $20-25 million, based on previously prepared estimates and industry guidelines.

O&M costs are estimated at $400-500 thousand per year using plant site staff.

C. Comparative Analysis Criteria

C.1 Risk Reduction

The risk reduction potential for mechanical evaporation would be minimal. Evaporated water would meet Segment 5 water quality criteria and other benchmarks identified in Table 3-1 prior to evaporation.

C.2 Funding and Schedule Constraints

The high level of funding required for this option, the large scale of construction effort involved, and the expected permitting requirements for this option all impose significant schedule constraints on this option. An estimated completion schedule is 3 to 5 years.

C.3 Cost-effectiveness

Mechanical evaporation of water meeting Table 3-1 benchmarks would not be cost-effective and would not represent a reasonable reduction in risk for the money spent.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C.4 Versatility

Mechanical evaporators are large facilities that would require a high level of operational control to ensure they are functioning properly, cannot be relocated, and cannot be expanded beyond design capacity. Their versatility in addressing changing water management needs would be low. These evaporators could not be used for contaminated water.

C.5 OU Interactions

This option wold be independent of all known OU actions.

C.6 Waste Generation

Waste generated from operations (in the form of concentrates or sludges) or cleaning could be regulated and difficult to dispose or store.

Option 4.7.1.8 Transfer Interior Ponds to Pond A-3 to Maintain Spill Control Capacity

A. Option Components and Basis of Conceptual Design

This option transfers water meeting imposed water quality control criteria from interior spill control ponds to Pond A-3 for eventual discharge.

Pumping - A portable pump station of approximately 500 gpm would be required to transfer water from Pond A-2 to Pond A-3. Due to lack of electrical power availability, this pump would operate on gasoline or diesel fuel.

Piping - Transfer piping consisting of approximately 300 additional feet of 6-inch diameter high density polyethylene (HDPE) pipe would be required to create a discharge point to Pond A-3.

B. Conceptual Cost Estimate

Pump station	$40,000
Valving	1,000
Piping	1,000
	$42,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C. Comparative Analysis Criteria

C.1 Risk Reduction

Transferring water that meets benchmarks identified in Table 3-1 would present no significant risk to human health and the environment.

C.2 Funding and Schedule Constraints

Due to its low cost, there would be no cost or schedule constraints for this option.

C.3 Cost-effectiveness

This option is a cost-effective method of maximizing available spill control capacity, thereby providing maximum protection to downstream waters.

C.4 Versatility

The pipeline used for this option could also be used to transfer water which requires treatment.

C.5 OU Interactions

This option has no OU interactions.

C.6 Waste Generation

No wastes would be generated by this option.

Option 4.7.2.9 Discharge Stormwater Ponds to Segment 4

A. Option Components and Basis of Conceptual Design

This option focuses on reduction of sampling efforts by discharging directly from ponds which meet Segment 4 standards and other benchmarks identified in Table 3-2 to downstream receiving waters.

Piping - Surface-laid piping necessary to discharge Ponds A-4, B-5 and C-2 to Segment 4 currently exists. Additional surface piping would be installed from Pond A-3 to a connection with the A-4 discharge piping north of Pond A-4.

Pumps - Pumps currently exist at Pond A-4, B-5 and C-2 for use in transfer or discharge operations. An additional pump would be installed at Pond A-3.

B. Conceptual Cost Estimate

Piping (A-3) at \$30/foot (1000')	\$30,000
Pump at A-3	25,000
	\$55,000

C. Comparative Analysis Criteria

C.1 Risk Reduction

Ponds A-4 and C-2 are currently discharged to Segment 4 in accordance with Segment 4 standards. Under current operational management, Ponds B-5 and A-3 would be monitored for a limited suite of indicator parameters (consistent with Segment 5 Standards) prior to transfer to Pond A-4 and discharge. Monitoring of these ponds for Segment 4 Standards and other Table 3-2 benchmarks, as required for discharges, is a more stringent requirement than currently exists. More stringent monitoring requirements are presumably more protective and thus represent a reduction in risk compared to current conditions.

C.2 Funding and Schedule Constraints

This option has no cost or schedule constraints due to its low cost, high use of existing facilities and ease of installation.

C.3 Cost-effectiveness

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

This option is a cost-effective method of managing stormwater discharges. Redundant sampling of Ponds A-3 and B-5 prior to transfer to Pond A-4 (which is in turn sampled prior to discharge) is eliminated in favor of a single, more stringent sampling event at Ponds A-3 and B-5. Operational costs would also be reduced by not handling A-3 and B-5 water a second time in Pond A-4.

C.4 Versatility

This option would provide greater versatility and flexibility than the current operational system. By discharging Ponds B-5 and A-3 directly to Segment 4, Pond A-4 would receive only a limited amount of routine inflow, making it available for non-routine storage of high flows resulting from spring runoff or large storm events. This pond would also be available to accept transfers of water from Ponds A-3, B-5 and C-2 that do not meet discharge standards, and would provide a central storage location that is adjacent to the existing A-4 treatment facilities.

C.5 OU Interactions

This option would maintain current capabilities to capture, store and monitor discharges and runoff from upstream OUs prior to off-site discharge. This option also would improve the operational flexibility of the ponds for dealing with future OU 5 and OU 6 remediation efforts and is consistent with expected final actions for water control and water management during cleanup operations.

C.6 Waste Generation

No wastes would be generated by this option.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4.7.2.10 Pipe Water from Pond C-2 to Walnut Creek in On-Site Pipeline

A. Option Components and Basis of Conceptual Design

This option utilizes the existing transfer piping between C-2 and the Walnut Creek drainages to eliminate discharges to the Standley Lake basin.

Pumping - A permanent pump station of approximately 500 gpm would be required to transfer water from Pond C-2 directly to the Walnut Creek drainage below Pond A-4 or B-5. Due to lack of electrical power availability, this pump station would operate on gasoline or diesel fuel.

Piping - Transfer piping consisting of 8-inch diameter high density polyethylene (HDPE) pipe which currently exists between Pond C-2 and Ponds B-5 and A-4. A tee, two gate valves and approximately 300 additional feet of pipe would be required to create a discharge point below Pond A-4 or B-5.

B. Conceptual Cost Estimate

Pump station	$80,000
Valving	10,000
Piping	1,000
	$91,000

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C. Comparative Analysis Criteria

C.1 Risk Reduction

Transferring water that meets benchmarks identified in Table 3-1 would present no significant risk to human health and the environment and would eliminate a perceived risk from residents in the Standley Lake basin.

C.2 Funding and Schedule Constraints

There would be no cost or schedule constraints for this option.

C.3 Cost-effectiveness

This option is a cost-effective method of reducing Pond C-2 discharges to Woman Creek and Standley Lake. This option cannot assure that Pond C-2 would not overtop during a flood event since runoff volume from an extreme event could exceed the storage capacity of C-2.

C.4 Versatility

The pipeline used for this option could also be used to transfer water to Pond B-5, Pond A-4 or directly to the Broomfield Diversion Ditch.

C.5 OU Interactions

This option would transfer water from the jurisdiction of OU 5 (Woman Creek) to the jurisdiction of OU 6 (Walnut Creek), but could be discontinued at any time and would not impact actions or planning efforts for these OUs under the Interagency Agreement (IAG).

C.6 Waste Generation

No wastes would be generated by this option.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Monitoring Options

Option 4.8.3 Monitor Influent Streams

A. Basis of Conceptual Monitoring Plan

Influent stream water would be sampled and analyzed for the water quality parameters that are currently monitored at RFP during a pre-discharge sampling event with Colorado Department of Health (CDH). These parameters include gross alpha, gross beta, ammonia, nitrate/nitrite, sulfate, sulfide, TDS, TSS, bicarbonate/carbonate, chloride, fluoride, semi-volatile organics, volatile organics, cyanide, HSL metals, triazine herbicides, organochlorine herbicides, and organophosphorus pesticides.

Influent streams would also be monitored in real-time for flow and indicator parameters (pH, temperature, conductivity) using instrumented flumes, weirs and water quality probes.

Samples would be taken monthly on each of the three RFP drainages.

B. Conceptual Cost Estimate

Laboratory Analytical Costs	$2500
Field (Sampling) Costs	300
	$2800 per sample
36 samples per year	$100,800

C. Comparative Analysis Criteria

C.1 Risk Reduction

No risk reduction associated with potential chemical exposure would be achieved by this option. Influent stream monitoring does not provide earlier detection capabilities than monitoring pond water directly due to the fact real-time analytical methods are unavailable for chemical constituents of concern at the low detection limits required. Monitoring of indicator parameters could provide early indication of potential water quality problems.

C.2 Funding and Schedule Constraints

There would be no funding or schedule constraints associated with this option.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C.3 Cost-effectiveness

Flow monitoring would promote efficient and cost effective pond water management by maximizing the planning time for pond water transfer or discharge operations. Monitoring of indicator parameters would be a cost-effective method for early identification of potential water quality problems.

C.4 Versatility

This option would provide versatility by monitoring a large number of water quality parameters and would allow time for remedial action prior to transfer or release.

C.5 OU Interactions

This option would be independent of all known OU actions.

C.6 Waste Generation

No waste would be generated by this option.

Option 4.8.4 Monitor Ponds

A. Basis of Conceptual Monitoring Plan

Pond water would be sampled and analyzed at regular intervals (monthly, quarterly, or annually) for COCs and Segment 5 analytes to demonstrate compliance with the ambient water quality requirements of Table 3-1. Pond volumes, dam piezometers, and indicator parameters (pH, temperature, conductivity) would be monitored in real time to assist operational management and stay apprized of changing conditions.

Sampling efforts for this option include radionuclide-specific analysis for plutonium, americium and uranium which results in higher analytical costs.

Ponds A-1, A-2, B-1 and B-2 would be sampled quarterly. Ponds A-3, A-4 and B-5 and the Landfill Pond will be sampled monthly.

B. Conceptual Cost Estimate

Laboratory Analytical Costs	$4000
Field (Sampling) Costs	300
	$4300 per sample
64 samples per year	$275,200

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C. Comparative Analysis Criteria

C.1 Risk Reduction

This option would ensure that contaminants in ponds that are not transferred or discharged would be detected and remedial actions could be implemented as needed. Pond volume and dam piezometer monitoring would ensure dam safety considerations are accounted for and uncontrolled discharges would not occur. This option would be protective of human health and environment and would promote compliance with the numeric water quality criteria adopted for this Interim Measures/Interim Remedial Action (IM/IRA) Decision Document.

C.2 Funding and Schedule Constraints

There would be no funding or schedule constraints associated with this option.

C.3 Cost-effectiveness

Cost effectiveness is a function of the frequency of routine water quality monitoring compared to the frequency with which operational monitoring is conducted. Monthly or quarterly monitoring at ponds which are also monitored at a similar frequency for operational reasons is redundant and not cost effective. Quarterly or annual monitoring of non-discharging ponds would be cost effective in determining compliance with ambient water quality criteria. Frequent volume and piezometer monitoring would be very cost-effective compared to the potential impacts from a dam failure.

C.4 Versatility

This option would provide versatility by monitoring different ponds at different frequencies depending on the frequency in which a particular pond undergoes monitoring for operational purposes.

C.5 OU Interactions

This option would be independent of all known OU actions.

C.6 Waste Generation

No wastes would be generated by this option.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4.8.5 Monitor Transfers

A. Basis of Conceptual Monitoring Plan

Ambient pond water quality would be sampled and analyzed prior to transfer operations for the parameters that are currently monitored at RFP during a pre-discharge sampling event with CDH. These parameters would include gross alpha, gross beta, ammonia, nitrate/nitrite, sulfate, sulfide, TDS, TSS, bicarbonate/ carbonate, chloride, fluoride, semi-volatile organics, volatile organics, cyanide, HSL metals, triazine herbicides, organochlorine herbicides, and organophosphorus pesticides. Analytical results would be compared against Segment 5 criteria and other benchmarks identified in Table 3-1. During transfers, flows and indicator parameters (pH, temperature, conductivity) would be monitored in real time to assist operational management and provide early warning of changing water quality conditions.

B. Conceptual Cost Estimate

Laboratory Analytical Costs	$2500
Field (Sampling) Costs	300
	$2800 per sample
12 samples per year	$33,600

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

C. Comparative Analysis Criteria

C.1 Risk Reduction

This option would ensure that contaminants that are both regulated and of particular concern would be detected in time to take remedial action prior to transfer to other ponds. This option would be protective of human health and the environment and would promote compliance with the numeric water quality criteria adopted for this IM/IRA Decision Document.

C.2 Funding and Schedule Constraints

There would be no funding or schedule constraints associated with this option.

C.3 Cost-effectiveness

This option would be a cost-effective method of determining compliance with benchmarks compared to monitoring for <u>all</u> Segment 5 parameters, many of which have never been detected in RFP waters.

C.4 Versatility

This option would provide versatility by monitoring a large suite of parameters prior to transfers and only indicator parameters (which would allow early detection of water quality problems) during transfers.

C.5 OU Interactions

This option would be independent of known OU actions.

C.6 Waste Generation

No wastes would be generated by this option.

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

Option 4.8.6 Monitor Discharges

A. Basis of Conceptual Monitoring Plan

Ambient pond water quality would be sampled and analyzed prior to discharge operations for the parameters that are currently monitored at RFP during a pre-discharge sampling event with CDH. These parameters would include gross alpha, gross beta, ammonia, nitrate/nitrite, sulfate, sulfide, TDS, TSS, bicarbonate/ carbonate, chloride, fluoride, semi-volatile organics, volatile organics, cyanide, HSL metals, triazine herbicides, organochlorine herbicides, and organophosphorus pesticides. Analytical results would be compared against Segment 4 criteria and other benchmarks identified in Table 3-2. During discharges, flows and indicator parameters (pH, temperature, conductivity) would be monitored in real time to assist operational management and provide early warning of changing water quality conditions. Whole Effluent Toxicity Tests (WET) would also be conducted on discharged water as a check on overall water quality (toxicity), and to comply with current Federal Facilities Compliance Agreement (FFCA) requirements.

B. Conceptual Cost Estimate

Laboratory Analytical Costs	$2500
Field (Sampling) Costs	300
	$2800 per sample
18 samples per year	$50,400

Laboratory Analytical Costs:	
for *Ceriodaphnia sp.*	$275
fathead minnows	500
field (Sampling) costs	300
	$1075 per sample
18 samples per year	$19,350

C. Comparative Analysis Criteria

C.1 Risk Reduction

APPENDIX F
DESCRIPTIONS OF RETAINED OPTIONS
(Continued)

This monitoring option would ensure that contaminants are detected in time to take remedial action prior to downstream discharge, and would achieve regulatory compliance. Biomonitoring would provide an assessment of overall water quality, but would be insufficient to determine compliance with chemical-specific numerical standards and overall risk to downstream water.

C.2 Funding and Schedule Constraints

There would be no funding or schedule constraints associated with this option.

C.3 Cost-effectiveness

This option would be a cost-effective method of determining compliance with Segment 4 criteria compared to monitoring for <u>all</u> Segment 4 parameters, many of which have never been detected in RFP waters. Biomonitoring provides information on the overall toxicity and water quality at a minimal cost.

C.4 Versatility

This option would provide versatility by monitoring a large suite of parameters prior to discharge and only indicator parameters (which would allow early detection of water quality problems) during discharge.

C.5 OU Interactions

This option would be independent of known OU actions.

C.6 Waste Generation

No wastes would be generated by this option.

APPENDIX G
EVALUATION OF PERSONNEL EXPOSURE FROM PROPOSED ALTERNATIVES

APPENDIX G
EVALUATION OF PERSONNEL EXPOSURE FROM PROPOSED ALTERNATIVES

Evaluation of Risks to Personnel due to Inhalation

August 3, 1992 EG&G Memorandum from R.S. Roberts to S.A. Pettis: Risks due to Spray Evaporation of B-2 Pond

September 29, 1993 WWE Calculation Sheets on Estimated Air Emissions

October 8, 1993 EG&G Memorandum From R.M. Garren to G.V. Porter: Pond Water IM/IRA Air Emissions Evaluation

Evaluation of Risks to Personnel due to Water Ingestion

EVALUATION OF RISKS TO PERSONNEL DUE TO INHALATION

AUGUST 3, 1992 EG&G MEMORANDUM
FROM R.S. ROBERTS TO S.A. PETTIS:
RISKS DUE TO SPRAY EVAPORATION OF B-2 POND

EG&G ROCKY FLATS

INTEROFFICE CORRESPONDENCE

DATE: August 3, 1992

TO: S. A. Pettis, Surface Water, Bldg. 80, X8615

FROM: R. S. Roberts, Remediation Programs, Bldg. 80, X8508

SUBJECT: RISKS DUE TO THE SPRAY EVAPORATION OF B-2 POND - RSR-016-92

A risk analysis was performed to evaluate the potential human health risk due to the spray evaporation of the B-2 pond. The results of this evaluation show that the carcinogenic risk due to this activity is 2.7E-10 and the Hazard Index is 4.5E-07. These values are well below the acceptable carcinogenic range of 1E-04 to 1E-06 and the acceptable Hazard Index of 1.0.

In order to calculate the above risks, it was assumed that an individual will live at the Rocky Flats Plant fence line for the next thirty years and that spray evaporation will continue for that period of time. This individual will be exposed to volatile organic compounds (VOC) that are volatilized from the spray head when water is sprayed over the B-2 pond. The VOCs volatilized during spray evaporation are transported from the spray head to the hypothetical individual at the fence line. This exposure scenario was reviewed and approved by the Department of Energy (DOE) and the Colorado Department of Health (CDH). All assumptions used in this analysis are outlined in Attachment I.

Attachment II shows the analytical results used in this risk analysis. Methylene Chloride, Acetone, 1,2-Dichloroethene and Trichloroethene were evaluated in this risk assessment. J and B qualified data were assumed to be present at the reported value.

If you have any questions or need support in presenting this information, please contact me.

dmf

Attachments:
As Stated (2)

cc:
G. M. Anderson
M. B. Arndt
R. C. Flory
D. S. Murray
D. M. Smith

SPRAY EVAPORATION RISK ASSUMPTIONS

A) Spray Evaporation Specifications

Average Flowrate = 1000 gallons\minute
Daily Exposure Duration = 10 hours\day
Annual Exposure Duration = 125 days\year
Duration of Spray Evaporation Activities = 30 years

B) Dispersion of Volatiles

CHI\Q = (1\(PI)(U)(SIGMA-Y)(SIGMA-Z))

PI = 3.1416
U = 4.7 meters\second
SIGMA-Y = 110 meters
SIGMA-Z = 43 meters
Distance to Individual = 1.6 kilometers
Stability Class = D

Assumptions were taken from the Plan For Prevention Of Contaminant Dispersion, dated February, 1992

Assume 100% volatilization from water

C) Inhalation of Volatilized Constituents

$$\text{Intake} = \frac{(ER)(CHI\backslash Q)(IR)(DEF)(AEF)(ED)}{(BW)(AT)}$$

ER = Emission Rate = Chemical Specific Value
CHI\Q = Dispersion Value
IR = Inhalation Rate = 0.83 m^3\hour
DEF = Daily Exposure Frequency = 10 hours\day
AEF = Annual Exposure Frequency = 125 days\year
ED = Exposure Duration = 30 years
BW = Body Weight = 70 kg
AT = Averaging Time = 70 Years (Carcinogens)
AT = Averaging Time = 30 Years (Non-Carcinogens)

Carcinogenic Risk = (Intake)(Slope Factor)

Hazard Index = Intake\Reference Dose

Slope Factors and Reference Doses used in this analysis were taken from the Integrated Risk Information System (IRIS) and the Health Effects Assessment Summary Tables (HEAST). The primary source was IRIS. Slope Factors and Reference Doses are current as of 7\30\92.

JUN 24 '92 02:34PM IT ANALYTICAL ST. LOUIS

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.
Pond B-2 6/22/92
NP50631WC

Lab Name: ITAS-ST. LOUIS Contract: 262.01

Lab Code: ITAS Case No.: -- SAS No.: SDG No.: ---

Matrix: (soil/water) Water Lab Sample ID: 2109-001

Sample wt/vol: 5 (g/ml) ml Lab File ID: >E4065

Level: (low/med) LOW Date Received: ~~00/00/00~~ 06/23/92

% Moisture: not dec. - Date Analyzed: 06/23/92

Column: (pack/cap) CAP Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ------	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	11	B
67-64-1	Acetone	18	
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	4	J
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	4	J
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U

J - below detect level

DRAFT

SEPTEMBER 29, 1993 WWE SHEET ON
ESTIMATED AIR EMISSIONS

WRIGHT WATER ENGINEERS, INC.
2490 West 26th Ave.-Suite 100-A
Denver, Colorado 80211
Tel. (303) 480-1700

Date 9-29-93 Sheet ___ of ___
Proj. No. 901.004.450
Proj. Name IM/IRA
Des. By Mende Ckd. By ___
Subject Estimated Air Emmisions

Potential Air Emmisions for IM/IRA Combined (Preferred) Option

1) Spray Evaporation

7 systems - 2 at Landfill, 2 at A-2, 1 each at A-1, B-1, and B-2

Each system will evaporate ~ 900,000 gallons over 180 days (5000 gal/day)

A) Water Quality of Evaporated Water - Use sample mean from Table 1.1, 1.3, or 1.8 (attached) for ambient concentration

B) Diesel Pumps - 1 Diesel Pump per system
Usage - 8 hr/day x 180 days = 1440 hrs
Fuel Consumption ~ 1.1 gal/hr

2) A-4 Discharge

A) Diesel Pump
Usage - 24 hr/day ~ 13 days/month = 3744 hr/year
Fuel Consumption ~ 3.3 gal/hr

B) Diesel Generator for A-4 Tent (50 kw)
Usage - 10 hr/day for 80 days/year = 800 hr/year
Fuel Consumption ~ 1.2 gal/hr

3) B-5 Transfer

A) Diesel Pump
Usage - 24 hr/day ~ 9 days/month = 2592 hr/year
Fuel Consumption ~ 3.3 gal/hr

B) Diesel Light Plant (15 kw)
Usage 10 hr/day ~ 9 days/month = 1080 hr/year
Fuel Usage ~ .35 gal/hr

4) C-2 Recycle System

A) ~~Gasoline Powered Pump~~ Propane Powered Pump 96 HP
~~Usage~~ Propane Usage = 11.4 lb/hr
Usage 25 days/month for 6 months 10 hr/day = 1500 hr/yr

5) A-4 Tent Propane System
Usage 10 hr/day x 180 days (est) = 1800 hr/year
Fuel Consumption ~ 7.2 lb/hr

* 6) Disregard aeration option - will be deleted

WRIGHT WATER ENGINEERS, INC.
2490 West 26th Ave. - Suite 100-A
Denver, Colorado 80211
Tel. (303) 480-1700

Date 9-29-93 Sheet ____ of ____
Proj. No. 901.004.450
Proj. Name IM/IRA
Des. By Mende Ckd. By ____
Subject ____

Calculation Sheet for Air Emmisions Estimate

Spray Evaporation Systems (Per Doug Murray - E646)

Operational April - September ~ 180 days

Evaporation estimate is 900,000 gal per system @ A-2 & LF

Pumps (Diesel) are run 8 hr/day (daylight hours only)

Fuel Usage estimate is 40 gal/wk (1 gal/hr)

B-5 Transfer and A-4 Discharge

Pump Fuel Usage is 10 gal/3 hrs @ ~ 800 gpm (Doug Lee - Riedel)

Light Plant Fuel Usage 15 kW / 144,000 BTU/gal x 2928 ~~kw-hr~~ = .35 gal/hr

OCTOBER 8, 1993 EG&G MEMORANDUM
FROM R.M. GARREN TO G.V. PORTER:
POND WATER IM/IRA AIR EMISSIONS EVALUATION

EG&G ROCKY FLATS

INTEROFFICE CORRESPONDENCE

DATE: October 8, 1993

TO: G. V. Porter, Surface Water Division, Bldg. T893A, X5661

FROM: R. M. Garren, Air Quality Division, Bldg. 080, X8512 RMG

SUBJECT: POND WATER IM/IRA AIR EMISSIONS EVALUATION - RMG-013-93

This correspondence accompanies the attached set of calculations used to evaluate potential air emissions from a list of proposed options provided by the Surface Water Division (SWD) for the Pond Water Management Interim Measures/Interim Remedial Action (IM/IRA). The proposed options were evaluated to determine if an Air Pollutant Emission Notice (APEN) or permit application would be required for spray evaporation activities and the operation of propane and diesel-fired equipment. The options were outlined in a correspondence from Wright Water Engineers, Inc. dated September 29, 1993. The following is a summary of the evaluation:

- Evaluation of spray evaporation activities described in option 1 of the letter indicate that emissions are well below reportable levels and the impact on air quality is negligible.

- The diesel-fired pump mentioned in part B of option 1 will not require an APEN or permit application based on the actual hours of operation. In order to demonstrate compliance to the Colorado Department of Health (CDH), an operating log documenting hours of operation and fuel consumption (if possible) must be maintained.

- The diesel-fired pump mentioned in options 2 and 3 **will require an APEN.** A permit application will not be required based on the actual hours of operation. The Air Quality Division will require proper notification of implementation plans in order to prepare and submit the appropriate paperwork to the CDH.

- The diesel-fired generator mentioned in part B of option 2 will not require an APEN or permit application based on the actual hours of operation. In order to demonstrate compliance to the CDH, an operating log documenting hours of operation and fuel consumption (if possible) must be maintained.

- The diesel-fired light plant mentioned in part B of option 3 will not require an APEN or permit application. An operating log for this unit is not necessary.

- The propane-fired pump mentioned in option 4 will not require an APEN or permit application based on the actual hours of operation. In order to demonstrate compliance to the CDH, an operating log documenting hours of operation and fuel consumption (if possible) must be maintained.

- The Pond A-4 tent propane system mentioned in option 5 will not require an APEN or permit application. An operating log for this unit is not necessary.

Any deviation in the hours of operation or the equipment listed in these options that will affect air emissions will require a re-evaluation by the Air Quality Division. Please notify the Air Quality Division immediately if an option is selected that requires an APEN. If you have any questions concerning this correspondence, please contact me at X8512 or digital page 4281.

RMG

Attachment:
As Stated

cc:
R. C. Nininger
C. A. Patnoe

OCTOBER 7, 1993 WWE CALCULATION SHEETS ON PROPOSED OPTIONS

Option 1 - Spray Evaporation

$$1 \times 10^{-6} g/\ell \times 0.0022046\ lb/g \times \frac{1\ \ell}{0.26418\ gal} = 8.345E{-9}\ lb/gal$$

8.345E-9 lb/gal or 0.008345 lb/gal E6 per 1 $\mu g/\ell$

5000 gal/day × 180 days = 900,000 gal/yr

Landfill total VOC concentration ≈ 238 $\mu g/\ell$

238 (.008345 lb/gal E6)(.9 gal E6/yr) = 1.79 lb/yr

2 units (1.79 lb/yr) = 3.58 lb/yr TOTAL VOC BASED ON 100% Vol.

A-2 total VOC concentration ≈ 32 $\mu g/\ell$

32 (.008345)(.9) = 0.24 lb/yr Total VOC

2 units (0.24 lb/yr) = 0.48 lb/yr Total VOC

A-1 total VOC Conc ≈ 32 $\mu g/\ell$

32 (.008345)(.9) = 0.24 lb/yr Total VOC

B-1 total VOC Conc. ≈ 58 $\mu g/\ell$

58 (.008345)(.9) = 0.44 lb/yr Total VOC

B-2 total VOC Conc. ≈ 58 $\mu g/\ell$

58 (.008345)(.9) = 0.44 lb/yr Total VOC

In order to exceed reporting limits for HAPs, VOC's & lead, $\mu g/l$ concentrations would have to be:

250 lbs/yr HAP = 33,287 $\mu g/l$

100 lbs/yr lead = 13,315 $\mu g/l$

2000 lbs/yr Criteria VOC = 266,294 $\mu g/l$

Individual pollutant levels are well below any of these levels

---

<u>Option 1</u> Part B

Diesel Pump

1440 hrs/yr (1.1 gal/hr)(.469 lb NOx/gal) = 742.9 lb/y

= <u>0.37</u> tons/yr NOx

At 8760 hr/yr = <u>2.26</u> ton/yr NOx

<u>Option 2</u> A-4 Discharge

A. Diesel Pump

3744 hr/yr (3.3 gal/hr)(.469 lb NOx/gal) = 5,794.58 lb/yr

= <u>2.90</u> ton/yr NOx

At 8760 hr/yr = <u>6.78</u> ton/yr NOx

B. Diesel generator for A-4 tent (50 kw)

800 hr/yr (1.2 gal/hr)(.469 lb NOx/gal) = 450 lb/y

= <u>0.22</u> tons/yr NOx

At 8760 hr/yr = <u>2.47</u> ton/yr NOx

Option 3 B-5 Transfer

A. Diesel Pomp

2592 hr/yr (3.3 gal/hr)(.469 lb NOx/gal) = 4011.6 lb/yr NOx

AT 8760 hrs = 6.78 ton/yr NOx

2.00 Ton/yr NOx

B. Diesel light plant

1080 hr/yr (.35 gal/hr) (.469 lbNOx/gal) = 177.3 lb/yr NOx

= 0.089 Ton/yr NOx

AT 8760 hrs = 0.72 ton/yr NOx

Option 4 C-2 Recycle System

Propane Powered pump (96 HP)

Propane usage = 11.4 lb/hr

$$\frac{11.4 \text{ lb/hr}}{4.235 \text{ lb/gal}} = 2.7 \text{ gal/hr}$$

1500 hr/yr (2.7 gal/hr)(.139 lb NOx/gal) = 562.95 lb/yr NOx

= 0.28 ton/yr NOx

At 8760 hrs = 1.64 ton/yr NOx

Option 5 A-4 Tent Propane System

propane usage 7.2 lb/hr

$$\frac{7.2 \text{ lb/hr}}{4.235 \text{ lb/gal}} = 1.7 \text{ gal/hr}$$

1800 hr/yr (1.7 gal/hr)(.139 lb NOx/gal) = 425.3 lb/yr NOx

= 0.213 ton/yr NOx

At 8760 hrs = 1.035 ton/yr NOx

EVALUATION OF RISKS TO PERSONNEL DUE TO WATER INGESTION

G.1 Summary

A CERCLA risk analysis was performed to evaluate the resulting differences in risk from pond water management alternatives described in the Interim Measures/ Interim Remedial Action (IM/IRA) Decision Document. A steady state model of the pond water flow and the risk results from the Baseline Risk Assessment were used together to predict changes in risk resulting from different water management actions. "Worst case" large volume spills were postulated to occur in each drainage area and the risks calculated for different spill control alternatives. Water storage, collection, and transfer options for non-spill conditions were also evaluated.

G.2 Introduction

A CERCLA human health risk comparison was performed where applicable for the retained options discussed in Chapter 5 and described in Appendix F of this document. The purpose of this risk evaluation was to provide quantitative assessment on risks relative to each proposed alternative as a tool for the IM/IRA Decision process on proposed actions. A compartmental flow model of the Rocky Flats surface water ponds was developed in order to predict the contaminant concentrations in the individual ponds and the resulting human health risks for a variety of pond management alternatives. Current baseline risk levels calculated in the Baseline Risk Assessment (Appendix D, summarized in Section 2.5), were used together with the flow model to predict the resulting risk reductions of proposed alternatives for spill capture and water storage/ transfer.

G.3 Model Description

A flow model was developed for the surface water ponds on North Walnut Creek South Walnut Creek and Woman Creek. The ponds included in the model are Ponds A-1, A-2, A-3, A-4, B-1, B-2, B-3, B-4, C-1, C-2, and the Landfill Pond. The model base case represents steady state flow averaged over the calendar year 1992 and is given in Figure G-1: Pond Flow Model. The flow data used in model are given in the following tables:

- Table G-1: S. Walnut Creek Flows
- Table G-2: N. Walnut Creek Flows
- Table G-3: Regulated Discharges and Woman Creek Flows
- Table G-4: Average Pond Capacities

The sources of data used for water release rates, pond capacities, and transfer between ponds include the 1992 Rocky Flats Environmental Report, EG&G Surface Water Operating Logs and Summaries, and the EG&G Surface Water flow monitoring network. The values for annual precipitation and evaporation used in the model were the average values for the Rocky Flats Plant site of 16 inches and 40 inches respectively.

G.4 Model Use and Method of Comparison

The model described above was developed to predict the results of introducing perturbations in the system; changes in water flow (re-routing water, spray evaporation, or elimination of ponds) and the addition of a contaminant (spills) were evaluated. Other IM/IRA option categories such as treatment and monitoring options were not evaluated since the model could not be as easily applied to these cases.

For simplicity in modeling spills, the assumption is made that the entire amount of chemical considered is dumped into the receiving pond and then the spill action alternative occurs. Since spills are not steady state events, then only those flows appropriate to the spill event are carried from the base model to the spill model. Restated, credit is taken for pond operator actions to implement the spill control measures according to the spill control alternative being evaluated. The risks associated with spills are then compared for each alternative quantitatively.

The Baseline Risk Assessment for the pond water was limited to the future residential land use scenario and the ingestion of surface water only. Even though this is a highly unlikely scenario, it served as the upper-bound of risk for any scenarios on-site as well as any current or future scenarios for receptors using the water off the Rocky Flats plant site. However, when comparing alternatives which differ in the amount of water which is released off plant site, then one must select which receptor, future on-site, or current off-site is to be the basis of comparison. For this analysis, the future on-site receptor drinking water from the ponds is the scenario for comparison since the baseline risks were calculated in this way.
In addition, the retained options are also evaluated and compared for the potential to spread contamination off the Rocky Flats plant site.

G.5 Spills

The following three sections model spills of carbon tetrachloride, trichloroethylene (TCE), and nitric acid. In the case of each spill, the contaminant has two or three possible fates based on the spill capture alternative :

- Captured by the existing ponds (Ponds A-1 and A-2 in the cases of the carbon tetrachloride spill, pond C-2 in the TCE spill, and Ponds B-1 and B-2 in the nitric acid spill). This is the no action alternative).
- Captured by a tank
- Captured by a single pond equivalent to the existing ponds. (The TCE spill analysis does not model an equivalent pond.)

The analysis assumes that 100% of the contaminant enters the applicable interceptor pond, that there is no loss of contaminant en route. Additionally, the only pathway analyzed is ingestion of contaminated water.

Table G-1 below summarizes the different values of risk and hazard quotients (HQs) to a hypothetical on-site resident individual who ingests the contaminated pond water. The values for risk and HQs were obtained from Sections G.5.1, G.5.2 and G.5.3.

The baseline risk is derived from the risk assessment contained in Chapter 2. This risk assessment assumes that concentrations are as summarized in Tables D-2.1 through D-2.8 in Appendix D of this report.

Table G-1
Comparison of Risks and HQs from Different
Contaminant Spills and Different Pond Configurations

	Existing Ponds	Single Spill Control Pond	Tanks
Carbon Tetrachloride	1.7E-5	1.7E-5	4.9E-6
TCE	HQ=0.071	Not Analyzed	HQ=0.071
Nitric Acid	2.13E-5	HQ=0.54	HQ=0.54

It is noted that the risk/hazard is identical for the existing two-pond configuration and the equivalent pond. Therefore, the construction of a single spill control pond cannot be justified from the basis of risk alone. Also, the tank option does not reduce the hazard from a spill, compared to the pond configuration, for spills of TCE or nitric acid, and has only marginally reduced risk compared to the pond configuration for a spill of carbon tetrachloride. Because of this, it may be difficult the extra expense of capturing tanks.

G.5.1 Building 707 Carbon Tetrachloride Tank Spill Into North Walnut Creek

This section of the appendix models a release of carbon tetrachloride from a 5040 gallon tank at Building 707. The entire tank contents are assumed to flow into North Walnut Creek without any carbon tetrachloride dissipating into the atmosphere, which is a simplifying if very conservative assumption because water ingestion is the only pathway analyzed. Three separate scenarios are used in this model, all of which are identical except for the receiving pond configuration. In all scenarios, the pathway modeled is ingestion; in other words, it is assumed that an individual living on plant site drinks 2 liters per day of contaminated water.

In the first scenario (analyzed in Section 5.1.1, No Action Alternative), the carbon tetrachloride flows into the presently used configuration of Ponds A-1 and A-2. There the contaminant mixes with the ponds. Since the ingestion period is extremely long (30 years in this model), it is assumed that both ponds reach equilibrium, and the carbon tetrachloride concentrations will be the same in all ponds.

In the second scenario (analyzed in Section 5.1.2, Replace Existing Ponds A-1 and A-2 With One Spill Control Pond), the carbon tetrachloride flows into a single spill control pond, with the same volume as present-day Ponds A-1 and A-2. There the contaminant mixes with the pond to form a homogeneous solution.

In the third scenario (analyzed in Section 5.1.3, Use of Tanks to Capture Spill), tanks are used to contain the spill. It is assumed that the tanks are 100 percent effective, and none of the carbon tetrachloride escapes containment.

G.5.1.1 Capture Using Existing Ponds

The ultimate carbon tetrachloride concentration is equal to the total amount of carbon tetrachloride released, divided by the total volume of the ponds. The resulting concentration of carbon tetrachloride is:

Conc = (5040 gal x 1.595[1] x 3.785 liters/gal x 1 gram/1000 liters) / [(0.33E6 gal + 2.04E6 gal) x 3.785 liters/gal] = 3.39E-6 g/L = 3.39 ug/L.

The cancer risk associated with daily ingestion of water contaminated with 3.39 ug/L of carbon tetrachloride is calculated using the following formula taken from EPA's Risk Assessment Guide for Superfund[2], modified for ingestion only. The oral slope factor for carbon tetrachloride is taken from the IRIS database.[3] The cancer risk is:

Risk = [Conc x EF x ED x IR_w x SF_o]/[BW x AT x 365 day/yr x (1000 ug/mg)]

where:
Conc = contaminant concentration = 3.39 ug/l
EF = exposure frequency = 350 day/yr
ED = exposure duration = 30 yr
IR_w = water drinking rate = 2 l/day
SF_o = oral slope factor = 0.13 kg-day/mg
BW = receptor body weight = 30 kg
AT = averaging time = 70 yr

Inserting these values into the equation:

Risk = [(3.39 ug/L) x (350 day/yr) x (30 yr) x (2 L/day) x (0.13 kg-day/mg)]/[(70 kg) x (70 yr) x (365 day/yr) x (1000 ug/mg)] = 1.21E-5 excess risk of contracting cancer. When added to the baseline risk of 4.9E-6, this comes to 1.7E-5 total risk.

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[1]The specific gravity of carbon tetrachloride at 20 C, taken from Page 3-25 of Perry's *Chemical Engineers' Handbook*, Fifth Edition.

[2]Environmental Protection Agency, Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989.

[3]IRIS Database Update, dated June 30, 1993.

Assumptions:
1. It is assumed that all of the carbon tetrachloride goes to the ponds. Actually, much of the contaminant will volatilize.

2. It is assumed that the ponds' concentration of carbon tetrachloride remains undiluted for 30 years of ingestion. The actual concentration will be diluted quickly from volatilization, inflow of precipitation water, etc.

3. It is assumed that an individual will use water from the ponds for his drinking water source. In fact, it is highly doubtful that a resident at Rocky Flats would wish to drink the pond water, as opposed to using municipally supplied water.

4. All pathways are ignored except for water ingestion.

G.5.1.2 Replace Existing Ponds A-1 and A-2 With One Spill Control Pond

The ultimate carbon tetrachloride concentration is equal to the total amount of carbon tetrachloride released, divided by the total volume of the single pond. This pond's volume is equivalent to the volume of existing ponds A-1 and A-2. The resulting concentration of carbon tetrachloride is identical to that calculated in Section 5.1.1, and is equal to 3.39 ug/l.

The cancer risk associated with daily ingestion of water contaminated with 3.39 ug/l of carbon tetrachloride is identical to that calculated in Section 5.1.1, and equals 1.21E-5 risk of contracting cancer. When added to the background risk of 5.1E-6, this comes to 1.7E-5 total risk.

Assumptions:
1. It is assumed that all of the carbon tetrachloride goes to the ponds. Actually, much of the contaminant will volatilize.

2. It is assumed that the ponds' concentration of carbon tetrachloride remains undiluted for 30 years of ingestion. The actual concentration will be diluted quickly from volatilization, inflow of precipitation water, etc.

3. It is assumed that an individual will use water from the ponds for his drinking water source. In fact, it is highly doubtful that a resident at Rocky Flats would wish to drink the pond water, as opposed to using municipally supplied water.

4. All pathways are ignored except for water ingestion.

G.5.1.3 Use of Tanks to Capture Spill

It is assumed that all of the spill is contained in the tanks, and that none of it is subsequently released. Under this assumption, there is no pathway to a receptor, and there is no risk. So the total risk is equal to baseline, and equals 4.9E-6.

Assumptions:
1. All pathways are ignored except for water ingestion.
2. It is assumed that all of the carbon tetrachloride is captured by the tanks, and that the tanks never release any contaminated water.

G.5.1.4 Comparison of Risk

Table G-2 below compares the different risks after a carbon tetrachloride spill under each of the different scenarios.

Table G-2
Risks After a CCl_4 Spill

	Existing Ponds	Single Spill Control Pond	Tanks
Risk	1.7E-5	1.7E-5	4.9E-6

G.5.2 Trichloroethylene Spill into the South Interceptor Ditch

This section of the appendix models a release of 110 gallons of trichloroethylene (TCE). The entire tank contents are assumed to flow into the South Interceptor Ditch without any

TCE dissipating into the atmosphere, a simplifying assumption. Two separate scenarios are used in this model, which are identical except for the receiving pond configuration. In both scenarios, the pathway modeled is ingestion; in other words, it is assumed that an individual living on plant site drinks 2 liters per day of contaminated water.

In the first scenario (analyzed in Section 5.2.1, No Action Alternative), the TCE flows into the presently used configuration of Pond C-2. There the contaminant mixes with the pond and its concentration is assumed to become uniform.

In the second scenario (analyzed in Section 5.2.2, Use of Tanks to Capture Spill), a tank is used to contain the spill. It is assumed that the tank is 100 percent effective, and none of the TCE escapes containment.

G.5.2.1 Capture by Existing Pond

The ultimate TCE concentration is equal to the total amount of TCE released, divided by the total volume of the pond. The resulting concentration of TCE is:

Conc = (110 gal x 1.466[4] x 3.785 liters/gal x 1 gram/1000 liters)/[4.96E6 gal x 3.785 liters/gal] = 3.25E-8 g/L = 0.033 ug/L.

The non-cancer risk associated with daily ingestion of water contaminated with 0.033 ug/l of TCE is calculated as a hazard quotient using the following formula taken from EPA's Risk Assessment Guide for Superfund[5]. The reference doses for TCE are taken from EPA's memo, Risk-Based Concentration Table, Third Quarter 1993.[6] The hazard quotient is:

$$HQ = [Conc \times EF \times ED \times (IR_w/RfD_o)]/[BW \times AT \times 365\ day/yr \times (1000\ ug/mg)]$$

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[4]The specific gravity of TCE at 20 C, taken from Page 3-43 of Perry's *Chemical Engineers' Handbook*, Fifth Edition.

[5]Environmental Protection Agency, Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), Interim Final, EPA/550/1-89/002, December 1989.

[6]Memo from Roy L. Smith, entitled "Risk-Based Concentration Table, Third Quarter 1993, dated July 9, 1993.

where:
Conc = contaminant concentration = 0.033 ug/L
EF = exposure frequency = 350 day/yr
ED = exposure duration = 30 yr
IR_w = water drinking rate = 2 l/day
RfD_o = oral reference dose = 6E-3 kg-day/mg
BW = receptor body weight = 70 kg
AT = averaging time = 70 yr

Inserting these values into the equation:

HQ = [(0.033 ug/l) x (350 day/yr) x (30 yr) x (2 l/day)/(6E-3 kg-day/mg)]/[(70 kg) x (70 yr) x (365 day/yr) x (1000 ug/mg)] = 6.56E-5. When added to the baseline Hazard Index of 0.071, the total hazard is 0.071.

G.5.2.2 Use of Tanks to Capture Spill

It is assumed that all of the spill is contained in the tanks, and that none of it is subsequently released. Under this assumption, there is no pathway to a receptor, and there is no excess hazard. So the hazard is equal to baseline, which is 0.071.

Assumptions:
1. All pathways are ignored except for water ingestion.
2. It is assumed that all of the TCE is captured by the tanks, and that the tanks never release any contaminated water.

G.5.2.3 Comparison of Hazard

Table 5.3 below compares the different Hazard Indices after a TCE spill under both scenarios. The difference in Hazard Index is not significant.

Table G-3

Hazard Indices After a Spill of Trichloroethylene

	Existing Ponds	Tanks
Hazard Index	0.071	0.071

G.5.3 Building 910 Nitric Acid Spill Into South Walnut Creek

This section of the appendix models a release of nitric acid from a 2000 gallon tank outside Building 910. The entire tank contents are assumed to degrade to nitrate, and flow into South Walnut Creek without any nitrate dissipating into the atmosphere or ground, a simplifying if very conservative assumption. Three separate scenarios are used in this model, all of which are identical except for the receiving pond configuration. In all scenarios, the pathway modeled is ingestion; in other words, it is assumed that an individual living on plant-site drinks 2 liters per day of contaminated water.

In the first scenario (analyzed in Section 5.3.1, No Action Alternative), the nitrate flows into the presently used configuration of Ponds B-1 and B-2. There the contaminant mixes with the ponds. Since the ingestion period is extremely long (30 years in this model), it is assumed that all ponds reach equilibrium, and the nitrate concentrations will be the same in all ponds.

In the second scenario (analyzed in Section 5.3.2, Replace Existing Ponds B-1 and B-2 With One Spill Control Pond), the nitrate flows into a single spill control pond, with the same volume as present-day ponds B-1 and B-2. There the contaminant mixes with the pond.

In the third scenario (analyzed in Section 5.3.3, Use of Tanks to Capture Spill), tanks are used to contain the spill. It is assumed that the tanks are 100% effective, and none of the nitrate escapes containment.

G.5.3.1 Capture by Existing Ponds

The ultimate nitrate concentration is equal to the total amount of nitrate released, divided by the total volume of the ponds. The resulting concentration of nitrate is

Conc = (2000 gal x 1.502[7] x 3.785 liters/gal x 1 gram/1000 liters) / [(0.35E6 gal + 1.01E6 gal) x 3.785 liters/gal] = 2.21E-6 g/L = 2.21 ug/L.

The non-cancer hazard quotient associated with daily ingestion of water contaminated with 2.21 ug/L of nitrate is calculated as a hazard quotient using the following formula taken from EPA's Risk Assessment Guide for Superfund[8]. The reference doses for nitrate are taken from the IRIS database.[9] The hazard quotient is:

$$HQ = [Conc \times EF \times ED \times (IR_w/RfD_o)]/[BW \times AT \times 365\ day/yr \times (1000\ ug/mg)]$$

where:
Conc = contaminant concentration = 2.21 ug/L
EF = exposure frequency = 350 day/yr
ED = exposure duration = 30 yr
IR_w = water drinking rate = 2 l/day
RfD_o = oral reference dose = 1.60 kg-day/mg
BW = receptor body weight = 70 kg
AT = averaging time = 70 yr

Inserting these values into the equation:

HQ = [(2.21 ug/L) x (350 day/yr) x (30 yr) x (2 l/day)/(1.60 kg-day/mg)]/[(70 kg) x (70 yr) x (365 day/yr) x (1000 ug/mg)] = 1.6E-5. When added to the baseline hazard index of 0.54, the resulting Hazard Index is 0.54.

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[7]The specific gravity of nitric acid at ambient (15 to 20 C), taken from Page 3-17 of Perry's *Chemical Engineers' Handbook*, Fifth Edition.

[8]Environmental Protection Agency, Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), Interim Final, EPA/550/1-89/002, December 1989.

[9]IRIS Database Update, dated June 30, 1993.

Assumptions:
1. It is assumed that all of the nitrate goes to the ponds. Actually, much of the contaminant will seep into the ground, etc.

2. It is assumed that the ponds' concentration of nitrate remains undiluted for 30 years of ingestion. The actual concentration will be diluted quickly from inflow of precipitation water, etc.

3. It is assumed that an individual will use water from the ponds for his drinking water source. In fact, it is highly doubtful that a resident at Rocky Flats would wish to drink the pond water, as opposed to using municipally supplied water.

4. All pathways are ignored except for water ingestion.

G.5.3.2 Replace Existing Ponds B-1 and B-2 With One Spill Control Pond

The ultimate nitrate concentration is equal to the total amount of nitrate released, divided by the total volume of the single pond. The pond's volume is equivalent to the volume of existing Ponds B-1 and B-2. The resulting concentration of nitrate is identical to that calculated in Section 5.3.1, and is equal to 2.21 ug/L.

The hazard associated with daily ingestion of water contaminated with 2.21 ug/L of TCE is identical to that calculated in Section 5.3.1, and the Hazard Quotient equals 1.64E-5. When added to the baseline hazard of 0.54, the resulting Hazard Index is 0.54.

Conservative Assumptions:
1. It is assumed that all of the nitrate goes to the pond. Actually, much of the contaminant will seep into the ground, etc.

2. It is assumed that the pond's concentration of nitrate remains undiluted for 30 years of ingestion. The actual concentration will be diluted quickly from inflow of precipitation water, etc.

3. It is assumed that an individual will use water from the pond for his drinking water source. It is highly doubtful that a resident at Rocky Flats would wish to drink the pond water, as opposed to using municipally supplied water.

Nonconservative Assumption:
1. All pathways are ignored except for water ingestion.

G.5.3.3 Use of Tanks to Capture Spill

It is assumed that all of the spill is contained in the tanks, and that none of it is subsequently released. Under this assumption, there is no pathway to a receptor, and there is no hazard. So the Hazard Index equals baseline, which is 0.54.

Assumptions:
1. All pathways are ignored except for water ingestion.
2. It is assumed that all of the nitrate is captured by the tanks, and that the tanks never release any contaminated water.

G.5.3.4 Comparison of Hazard

Table 5.4 below compares the different risks posed by the nitrate spill under each of the different scenarios. Differences in Hazard Indices are unnoticeable.

Table G-4
Hazard Resulting From a Nitrate Spill

	Existing Ponds	Single Spill Control Pond	Tanks
Hazard Index	0.54	0.54	0.54

G.7 Water Storage /Transfer Options

Water storage and transfer involves the routine collection and storage of the Rocky Flats sewage treatment plant (STP) effluent and stormwater runoff from the plant site. Water is then transferred to a location where it can be isolated for proper monitoring before being released off-site. Water storage and transfer alternatives analyzed include recycling all or part of the STP and stormwater on-site, changing pond water release points, and spray evaporating more of the pond water on-site in leu of releasing it off-site. The alternatives in this category were presented in Section 5 of the IM/IRA Report as proposed additional management tools rather than mutually exclusive alternatives. Hence each alternative will be evaluated for potential risk reduction relative to the no action or baseline risk given in Appendix D of this report.

G.7.1 Existing Pond Water Management Plan

The risks resulting from existing pond water management for routine collection, storage and transfer operations (described in Section 2.2) were assumed to be the risks calculated in the baseline risk assessment from the chemical concentration data measured in each pond. These total cancer and non-cancer risks are given in Appendix D in Tables D-1.1 to D-1.8.

G.7.2 Recycle / Tank STP Water

From Figure G-1 and Table G-1, the current flow from the STP into S. Walnut Creek occurs at Pond B-3 at the average flow rate of 141 kgal/day (thousand gallons per day).
It can also be seen that this is currently the major source of water to Pond B-3. The Pond B-3 water then flows to Pond B-4 and then B-5 where it is held until being transferred to Pond A-4 for release.

The contaminants of concern (COCs) for Pond B-3 (Site 4) in the baseline risk assessment included two radionuclides with a combined lifetime excess cancer risk (LECR) of 5.4E-7. See Table D-2.4 in Appendix D. The metal, inorganic, and organic COCs combined to produce a hazard index of 0.0004. Since these risk levels are low compared to EPA standards, reducing or eliminating the STP effluent flow into the pond system by recycling the water to use on plant site or collecting the effluent in a tank will not appreciably reduce the human health risk for a future on-site receptor. However , it could reduce the release of water and spread of contamination off-site.

G.7.3 Direct Spray Evaporate Ponds

Currently spray evaporation is used to limit the amount of water transferred and released from Pond A-2 and the Landfill Pond. One proposed action is to use spray evaporation in smaller Ponds A-1, A-2, B-1, B-2 to keep these ponds at lower levels between precipitation events. The net effect of spray evaporation on contaminant levels in the pond being sprayed is normally an increase. However, if the volume sprayed is limited to the precipitation inflow, then spraying does not concentrate contaminants in the pond and so does not affect risk at the pond. Spray evaporating Ponds B-1 and B-2 under normal conditions (no spill) would reduce or eliminate the need to transfer water from Pond B-2 to A-2 and reduce the potential to spread low level contamination. In a previous analysis, the additional risk posed to off-site receptors from spray evaporation via the direct inhalation pathway was evaluated for Pond B-2 for several volatile organics and was shown to be below the EPA acceptable risk range for carcinogenic and noncarcinogenic risk. A copy of this analysis, "Risks Due To Spray Evaporation of B-2 Pond" -RSR-016-92 is attached.

M.7.4 Redirect Water from Woman Creek to Walnut Creek Downstream of Pond A-4

One water transfer alternative is to divert water in Woman Creek to Walnut Creek down stream of A-4 through an on-site pipeline. Since this action would not reroute water flowing into any of the ponds on plant-site or introduce contaminants, then the contaminant concentrations in the ponds and hence the risk would not be expected to change.

Table G-1 : South Walnut Creek Flows

	Monthly Pond Flow Data								
	S. Walnut Creek Flows								
	Waste Water Treatment Plant Effluent	Central Ave Drain Ditch from Plantsite	B1 Bypass Pipeline to B4	Central Ave Drain Ditch to B5	B1 Transfer to B2	B2 Transfer To A2	B3 Natural Flow to B4	B4 Natural Flow to B5	B5 Discharge to A4
		SW022	GS010					GS009	
	(Mgal)	(Mgal)	(Mgal)	(Mgal)	(Mgal)	(Mgal)	(Mgal)	(Mgal)	(Mgal)
1991									
January	6.41								
Feburary	4.96								
March	6.03								
April	6.00								
May	6.14								
June	5.07		0.78						
July	4.03		3.42						
August	3.41		5.82						
September	3.00		1.79						
October	3.41	0.25	1.25						
November	3.30	8.53	1.86						7.20
December	3.41	3.10	1.01						11.40
1991 Total Flow	55.17								
Yearly Ave Flow Rate (kgal/day)	**151**								
1992									
January	3.9	0.03	1.22		0.00	0.00		n. d.	3.60
Feburary	3.5	0.00	1.14		0.00	0.00		n. d.	5.90
March	5.0	5.41	12.60		0.00	0.00		n. d.	5.76
April	3.9	0.14	3.32		0.00	0.00		n. d.	5.89
May	4.0	1.51	n. d.		0.00	0.00		13.33	0.00
June	4.5	0.34	7.87		0.00	0.00		16.14	10.02
July	4.3	0.00	15.01		0.00	0.00		14.90	8.60
August	4.7	0.94	n. d.		0.00	0.00		21.49	0.00
September	3.9	0.00	16.76		0.00	0.00		11.69	9.35
October	4.0	0.53	n. d.		0.02	0.33		n. d.	0.00
November	4.5	3.29	1.15		0.00	0.00		n. d.	5.63
December	5.3	0.89	0.81		0.00	0.00		n. d.	9.74
1992 Total Flow	**51.5**	**13.07**			**0.02**	**0.33**			**64.49**
Yearly Ave Flow Rate (kgal/day)	**141**	**36**	**219**		**0.05**	**0.90**	**141**	**507**	**177**

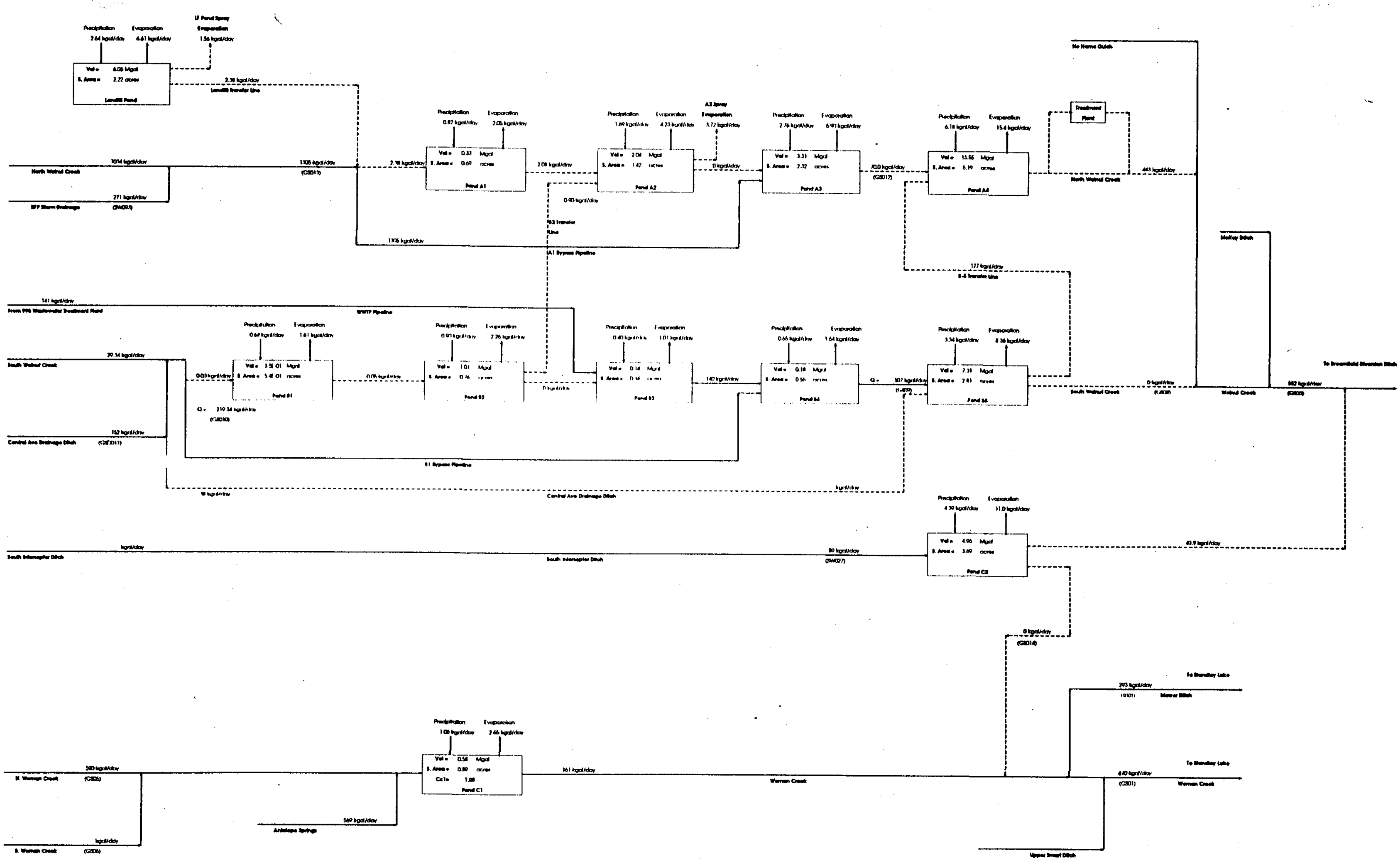
Table G-2 : North Walnut Creek Flows

	Monthly Pond Flow Data								
	N. Walnut Creek Flows								
	North Walnut Creek SW093 (Mgal)	A1 Bypass Pipeline to A3 GS013 (Mgal)	A1 Bypass Pipeline to A1 (Mgal)	A1 Outlet leak to A2 (Mgal)	A2 Spray Evap (Mgal)	Landfill Pond Effluent to A3 (Mgal)	Landfill Pond Effluent to A1 (Mgal)	Landfill Spray Evap (Mgal)	A3 Discharge to A4 (GS012) (Mgal)
1991									
January									
Feburary									
March									
April									
May		50.70							
June		34.30							
July		23.60							
August		30.90							
September		14.80							
October	2.80	n. d.							
November	6.78	54.00							
December	7.81	24.70							11.30
1991 Total Flow									
Yearly Ave Flow Rate (kgal/day)		**1089**							
1992									
January	6.81	21.80	0.00	0.00	0.00		0.00	0.00	0.00
Feburary	5.81	15.70	0.00	0.00	0.00		0.00	0.00	2.50
March	26.09	125.60	0.00	0.00	0.00		0.87	0.00	9.59
April	9.08	45.30	0.00	0.00	0.00		0.00	0.00	3.09
May	8.85	39.30	0.41	0.25	0.00		0.00	0.00	0.00
June	6.23	58.30	0.81	0.51	0.26		0.00	0.00	2.45
July	4.02	68.00	0.00	0.00	0.37		0.00	0.00	0.00
August	8.14	9.94	0.00	0.00	0.37		0.00	0.00	1.79
September	2.67	12.10	0.00	0.00	0.36		0.00	0.25	5.16
October	5.14	n. d.	0.00	0.00	0.00		0.00	0.32	0.00
November	7.00	1.19	0.00	0.00	0.00		0.00	0.00	1.04
December	9.24	39.80	0.00	0.00	0.00		0.00	0.00	0.00
1992 Total Flow	**99.07**		**1.22**	**0.76**	**1.36**		**0.87**	**0.57**	**25.62**
Yearly Ave Flow Rate (kgal/day)	**271**	**1305**	**3.3**	**2.1**	**3.7**		**2.4**	**1.6**	**70.0**

Table G-3 : Regulated Discharges and Woman Creek Flows

	Monthly Pond Flow Data									
	Regulated Discharges				Woman Creek Flows					
	Pond A4 (GS011) (Mgal)	Pond C1 (GS007) (Mgal)	Pond C2 To BDD (Mgal)	Walnut Creek at Indiana GS003 (Mgal)	Woman Creek at Indiana GS001 (Mgal)	Mower Ditch at Indiana GS002 (Mgal)	N. Woman Creek GS005 (Mgal)	S. Woman Creek GS006 (Mgal)	South Interceptor Ditch Input to C2 SW027 (Mgal)	Antelope Springs GS016 (Mgal)
1991										
January	1.05	8.95	0.00							
Feburary	11.52	9.77	0.00							
March	13.19	2.94	0.00							
April	7.16	4.46	0.00							
May	14.93	8.32	0.00			7.17	20.50			
June	46.34	7.10	10.77			9.60	61.09			
July	3.92	1.53	0.00		0.00	0.30	5.38			
August	7.16	3.37	0.00		0.00	1.98	5.05			
September	12.52	0.67	0.00		0.00	0.20	6.15			
October	7.95	2.45	0.00		0.00	0.04	n. d.		0.02	
November	0.00	8.86	0.00		0.00	31.11	26.46		3.24	
December	27.08	5.90	0.00		1.57	15.17	20.61		0.75	
1991 Total Flow	152.80	64.31	10.77							
Yearly Ave Flow Rate (kgal/day)	**419**	**176**	**30**			**268**	**679**			
1992										
January	1.08	7.33	0.00	8.13	35.61	5.88	23.48		1.03	
Feburary	5.31	5.76	0.00	4.34	32.80	3.64	17.19		0.26	
March	44.31	15.83	8.48	77.77	49.99	20.17	47.77		25.57	
April	17.49	12.91	7.60	20.72	40.49	8.00	14.06		0.37	
May	11.80	3.55	0.00	11.23	11.84	20.31	9.75		0.25	
June	5.15	1.85	0.00	6.42	14.60	24.78	10.21		0.58	
July	16.28	0.05	0.00	16.71	0.00	8.02	6.31		0.01	
August	0.00	1.22	0.00	0.86	0.00	0.19	8.13		3.49	
September	27.83	low flow	0.00	25.51	0.01	0.34	9.51		0.00	
October	8.91	1.60	0.00	7.77	n. d.	n. d.	n. d.		0.00	
November	0.00	3.33	0.00	0.00	0.02	3.05	25.39		0.50	
December	24.12	5.69	0.00	22.54	n. d.	3.61	25.92		0.39	
1992 Total Flow	**162.27**	**59.10**	**16.08**	**202.00**					**32.46**	
Yearly Ave Flow Rate (kgal/day)	**443**	**161**	**44**	**552**	**610**	**293**	**590**		**89**	

FIGURE G-1: Rocky Flats P[illegible]ater Flow Model



APPENDIX H
STANDARD OPERATING PROCEDURES FOR POND WATER MANAGEMENT

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1-C90-EPR-SW.03
Containment of Spills Within the Rocky Flats Drainages

This procedure describes actions that should be taken to contain a spill which has entered a drainage and is threatening to enter the surface water detention ponds in the Buffer Zone. These actions will help to minimize damage to the environment and to plant operations.

Driver(s)
- a) Agreement in Principle (AIP)
- b) DOE Order 5400.1, General Environmental Protection Program

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1-C91-EPR-SW.01
Requirement for Control and Disposition of Incidental Waters

This procedure contains the actions required for the control and disposition of incidental waters. The purpose of this procedure is to assure environmental protection by controlling, containing, sampling, analyzing, and/or discharging incidental waters originating from Rocky Flats sources.

Driver(s)
- a) Best Management Practices (BMPs)
- b) Safe Drinking Water Act (SDWA)
- c) Clean Water Act (CWA)

1-C92-EPR-SW.02
Control of Rocky Flats Flood Waters

This procedure is intended to provide instructions for controlling and containing excessive runoff and to minimize flooding. This instruction falls within the context of Rocky Flats water management plans.

Driver(s)
- a) Colorado State regulations on dam safety
- b) DOE Order 5400.1, General Environmental Protection Program

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APPENDIX H
STANDARD OPERATING PROCEDURES FOR POND WATER MANAGEMENT
(Continued)

5-21000-OPS-SW.01
Surface Water Data Collection Activities

This Standard Operation Procedure (SOP) describes procedures that will be used at the Rocky Flats Plant (RFP) in performance of field activities at surface water collection sites. This SOP describes initial site evaluation procedures and outlines an order of data collection activities to be performed at each site by a two or three member field crew. Details are provided in this document so that all sampling personnel following these procedures will deliver samples to the laboratory and will perform discharge and field parameter measurements in a consistent manner.

Driver(s)
- a) DOE Order 5400.1, General Environmental Protection Program
- b) EPM/SWD NPDES-FFCA Operations Sampling Plan

5-21000-OPS-SW.02
Field Measurements of Surface Water Field Parameters

This SOP describes procedures that will be used at RFP to obtain measurements of surface water parameters in the field. These parameters are temperature, dissolved oxygen, pH, alkalinity, specific conductance, total residual chlorine, free chlorine, turbidity, hardness and nitrates. This SOP describes field measurement procedures, personnel responsibilities and qualifications, and quality assurance/quality control (QA/QC).

Driver(s)
- a) NPDES-FFCA Operations Sampling Plan
- b) DOE Order 5400.1, General Environmental Protection Program

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APPENDIX H
STANDARD OPERATING PROCEDURES FOR POND WATER MANAGEMENT
(Continued)

5-21000-OPS-SW.03
Surface Water Sampling

This SOP describes procedures, documentation and equipment that will be used to collect water quality samples from surface water data collection sites at RFP. More than one sampling method is required because flow conditions vary from site to site. In consideration of these varied conditions, this SOP describes methods that are to be used on the site-specific flow conditions.

Driver(s)
- a) NPDES-FFCA
- b) DOE Order 5400.1, General Environmental Protection Program

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5-21000-OPS-SW.04
Discharge Measurement

This SOP describes procedures that will be used at RFP to measure surface water discharge in streams and ditches or from seeps and pipes. Discharge is defined as the volume rate of flow of water, including any substances suspended or dissolved in the water. This document outlines a set of standard methods for various flow conditions at RFP.

This SOP describes equipment and procedures that will be used for field data collection and documentation in order to attain acceptable standards of accuracy, precision, comparability, representativeness and completeness.

Driver(s)
- a) NPDES-FFCA
- b) DOE Order 5400.1, General Environmental Protection Program

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APPENDIX H
STANDARD OPERATING PROCEDURES FOR POND WATER MANAGEMENT
(Continued)

1-15200-EPIP-12.14
Water Detention Pond Dam Failure

This procedure describes emergency response actions to be taken in the event of actual or potential unplanned releases of detention pond dam water from RFP. It also defines seven action levels (0 through 6) for categorizing conditions at the dams up to and including dam failure.

Driver(s)

a) Colorado Radiological Emergency Response Plan, Rocky Flats Plant
b) DOE Order 5500.1B, Emergency Management System
c) DOE Order 5500.3A, Planning and Preparedness for Operational Emergencies

APPENDIX H
STANDARD OPERATING PROCEDURES FOR POND WATER MANAGEMENT
(Continued)

5-21000-OPS-SW.19
Control Procedure for Water Discharges from Surface Water Control Ponds A-3, A-4, B-3, B-5, C-1 and C-2

This procedure describes sampling, analytical, reporting and approval activities required prior to initiating discharges, and describes operational and monitoring activities during actual discharges.

Driver(s)
- a) Agreement in Principle (AIP)
- b) DOE Order 5400.1, General Environmental Protection Program

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5-21000-OPS-SW.20
Control Procedure for Water Spraying from the Landfill Pond and Pond A-2 and for Internal Pond Water Transfers

This procedure describes pre-operational activities including sampling, analytical and approval requirements, and describes operational controls governing actual operations.

Driver(s)
- a) Agreement in Principle (AIP)
- b) DOE Order 5400.1, General Environmental Protection Program

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5-21000-OPS-SW.27
Dam Inspection and Monitoring Procedure

The purpose of the dam inspection procedure is to identify existing or potential dam safety concerns and to provide a shorter frequency between formalized dam inspections currently performed by other groups or agencies. Dam safety monitoring is performed for previously identified dam safety concerns.

Driver(s)
- a) Colorado State regulations on dam safety
- b) DOE Order 5400.1, General Environmental Protection Program

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APPENDIX H
STANDARD OPERATING PROCEDURES FOR
POND WATER MANAGEMENT
(Continued)

1-15200-EPIP-12.14
Water Detention Pond Dam Failure

This procedure describes emergency response actions to be taken in the event of actual or potential unplanned releases of detention pond dam water from RFP. It also defines seven action levels (0 through 6) for categorizing conditions at the dams up to and including dam failure.

Driver(s)

a) Colorado Radiological Emergency Response Plan, Rocky Flats Plant
b) DOE Order 5500.1B, Emergency Management System
c) DOE Order 5500.3A, Planning and Preparedness for Operational Emergencies